

## THE OLDEST SURVIVING ROCK ART: A TAPHONOMIC REVIEW

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*Robert G. BEDNARIK\* - Melbourne*

### INTRODUCTION

The oldest rock art we know about in Europe, Africa, Asia, Australia, North America and South America are linear grooves and cupules, especially the latter. It can date from Middle Palaeolithic times in the first four continents mentioned, in Asia and Africa even from the Lower Palaeolithic. This has become evident despite the considerable bias against such forms of rock art, which have often been ignored by researchers, misunderstood or explained as utilitarian rock markings. However, cupules are such a ubiquitous feature in world rock art that they were made in many periods, and considerable experience is required to estimate their age (Bednarik 1997a).

Cupules, or cup marks, are cup-shaped to hemispherical percussion petroglyphs. Numerically they are probably the most common form of rock art in the world, and they can be found not only in very early and archaic traditions, but also in very recent ones. In India, for example, cupules were made in the Pleistocene, but most are from the Holocene, and they were made from Acheulian to Historic times. In many parts of Europe, including Britain, cupules seem particularly numerous from the Neolithic and the Metal Ages. It would therefore be false to assume that cupules are always an indication of archaic traditions.

It is also very doubtful that all cupules were made for similar purposes, and it is even possible that *some* of those found on horizontal surfaces were used for some utilitarian process. However, there are distinct differences between cupules and grinding hollows. The latter occur on horizontal surfaces only and are well over 10 cm in size, whereas cupules are frequently found on vertical walls and usually do not exceed 10 cm diameter.

Cupules rarely occur singly, they usually form groups, often numbering in their hundreds on a single panel. In some traditions they tend to be arranged systematically, for instance in rows or multiple rows, while in others they were made randomly. In the few cases where ethnographic meanings have been secured for cupules, in North America, east Africa and Australia, they suggest that their

function was often, though certainly not always, ceremonial or symbolic. For instance Mountford (1976: 213), who witnessed the making of cupules in central Australia in the 1940s, reports that these were made as an increase ritual for the pink cockatoo (*Kakatoe leadbeateri*). The particular rock the cupules were hammered into was thought to contain the life essence of these birds, so the mineral dust rising from the activity was believed to fertilise the female cockatoos and thus increase their production of eggs, which the Australids valued as food. This example tells us nothing about the purpose of cupules anywhere else, but what it does tell us is much more important: that it is entirely futile to speculate about the meaning of rock art in the absence of reliable ethnographic information.

An ethnographic example of non-ceremonial cupules comes from southern Kenya, where Odak (1988) has described geometric assemblages of cupules. They are claimed to have been used in board games such as the *boa* game, but even in that region cupules were probably also used for other purposes (e.g. in ore processing). It is simply unwise to generalise about meaning and purpose, which applies to all rock art.

#### ANCIENT CUPULE TRADITIONS

Despite the still poor knowledge we possess about the age of all rock art, we are on much safer ground here with any speculations. This is not so much because of the state of our knowledge, but because propositions about the age of rock art, in contrast to those about meaning, are falsifiable, hence testable and thus scientific. Whereas a future refinement of methodology is highly likely to result in increased veracity and precision of dating claims, no improvement of methodology can ever increase our confidence in interpretations of meanings of rock art. While the present state of our knowledge of rock art remains unsatisfactory, and the over-interpretation of scientific dating results is a cause for concern (Bednarik 1996a), it is fair to say that in some parts of the world we have acquired adequate data to construct preliminary rock art chronologies. These are based on a variety of archaeological (i.e. inductive) and geomorphological or geochemical observations. The advent of 'direct dating' methods, in particular, has led to a great improvement in chronological resolution. We can therefore, in various parts of the world, estimate the ages of cupules as well as of other rock art. The following picture has emerged in recent years.

The oldest currently known rock art was found in Asia. Eleven petroglyphs occur in Auditorium Cave, central India (Bednarik 1993a), of which two were excavated in an Acheulian occupation deposit directly covering them (fig. 1). The overlying Middle Palaeolithic stratum is so solidly cemented by calcite deposition that the stratigraphy could not possibly have been disturbed, hence



Fig. 1 - Acheulian cupule and linear petroglyph on very hard quartzite, found covered by Acheulian occupation deposit in Auditorium Cave, Madhya Pradesh, India.

we have no choice but to attribute at least two of the petroglyphs (one of which is a cupule) to the Lower Palaeolithic. However, I have argued that the remaining nine motifs (all cupules), although found above ground, are almost certainly of similar age (Bednarik 1996*b*). They are located on the vertical panel of a huge boulder on the floor of the cave, called Chief's Rock (fig. 2, *a*). The Auditorium Cave petroglyphs occur on heavily metamorphosed, extremely hard quartzite which was extensively quarried for stone tool material in the Lower Palaeolithic. Most Acheulian hand axes and cleavers at the site are made from it. The petroglyphs occur in the central part of the cave, well protected from weather, yet they are extremely corroded due to their extraordinary antiquity. Although there is no radiometric dating available from the rock art site, the Acheulian of India is of an age similar to that in Africa and Europe, and the radiometric estimates it has allowed so far are in excess of 290,000 years. It is thought to have given way to Middle Palaeolithic technologies some time between 200-150,000 years ago, which is thus a minimum age for the petroglyphs. This is confirmed by an attempt to analyse the microerosion of one of the Auditorium Cave cupules, which was inconclusive because the marking was found to be beyond the method's effective range (Bednarik 1996*b*).

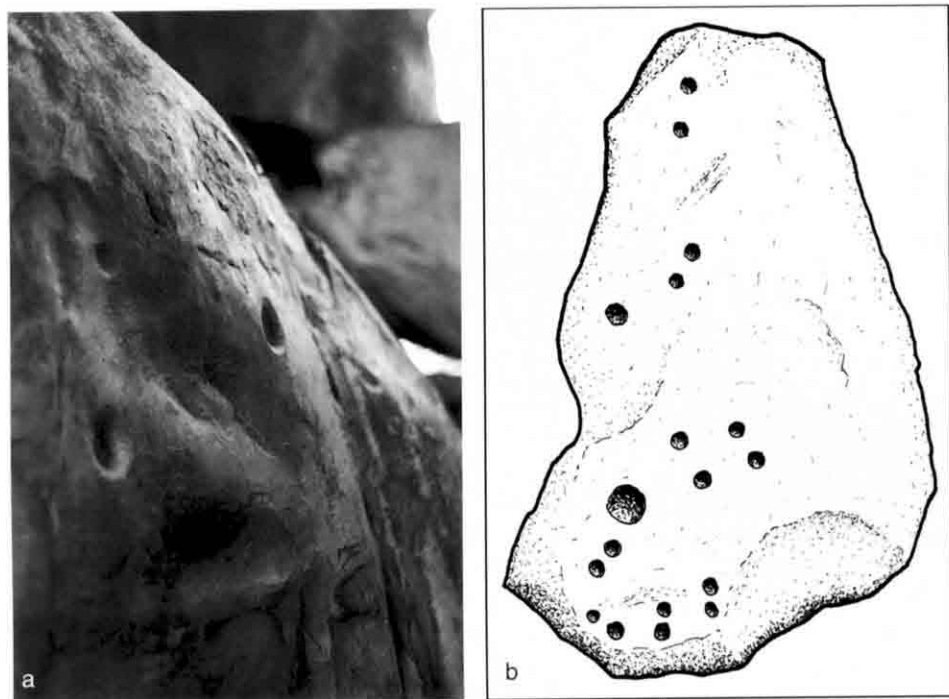


Fig. 2 - *a*, Three of the nine cupules found on the vertical surface of Chief's Rock, Auditorium Cave, India, thought to be of the same antiquity as the motifs in fig. 1; *b*, The cupules on the limestone slab Neanderthals placed over burial n. 6 at La Ferrassie, France.

Kumar (1996) has reported a second cupule site in central India that appears to be of extremely great age. Daraki-Chattan is a small quartzite cave with Acheulian and Middle Palaeolithic tools occurring on the surface of its floor deposit. The two walls of the cave bear 498 cupules, and in June 2002 an excavation of the sediment below them yielded several more cupules on exfoliated rock fragments. These were recovered in the cave's Acheulian occupation horizon hence there can be no doubt about their Lower Palaeolithic age.

The oldest cupules known in Europe are also the oldest rock art we have found in that continent. Neanderthal burial No. 6 of the French cave La Ferrassie is of a child, and after the corpse was placed in the grave, a large limestone slab was deposited over it in such a way that the eighteen cupules on its surface came to be on its underside, i.e. were facing the child's body (Peyrony 1934: 34). This burial is part of a Mousterian cemetery of unknown age. The entire find suggests great cultural complexity (fig. 2, *b*). Cupules have also been found at other sites of the late Mousterian (Leonardi 1988) and at sites of the period connecting the Mousterian with the Early Aurignacian of south-western Europe (Châtelperronian, Périgordian) (de Beaulieu 1993; Lalande and Bouyssonie 1946),

as well as from more recent Palaeolithic sites, e.g. of the Magdalenian.

Cupules are widespread in Africa, from the Sahara (Mori 1990-91, 2000) to South Africa, but apart from an archaeologically derived minimum age estimate of about 6300 years for a panel in the Chifubwa Stream rockshelter of Zimbabwe (Clark 1958: 21) we have no indications of their antiquity. However, current research by Peter Beaumont suggests extremely early dates for some Kalahari cupule sites. Moreover, the pecked phonolite cobble from Olduvai FLK North 1 in Bed 1, Tanzania (Leakey 1971: 269) bears a cupule on each side and is significantly older than any similar find.

In Australia, however, it is now widely agreed that cupules are among the oldest rock art of the continent (Bednarik 1993*b*; Chaloupka 1993; McNickle 1993; Taçon *et alii* 1997; Welch 1993). They are particularly common in northern Australia, where they invariably seem to precede any other rock art present at sites, be it in the Pilbara, Kimberley, Victoria River district or in north Queensland. They occur here at hundreds of sites, often in incredible numbers and concentrations (fig. 3, *a*).

Recently it has been suggested that one such site, Jinmium in the far north-west of the Northern Territory, had provided sensational dating evidence (Fullagar *et alii* 1996). A series of thermoluminescence analyses on quartz grains from the shelter's sediment floor yielded results that were interpreted as indicating that the site was first occupied by humans between 176,000 and 116,000 years ago, and that an exfoliated rock fragment bearing two cupules occurred in a layer of between 75,000 and 58,000 years of age. The TL method used is considered unsuitable for the site's saprolithic sediments, which are in fact under 10,000 years old, and the rock art is thought to be of the Holocene (Bednarik 1996*c*; Roberts *et alii* 1998).

Nevertheless, some cupules are still extremely old in Australia, and the tradition of creating them was probably introduced from Asia at the time of first landfall. Australia is currently thought to have been occupied initially by humans perhaps 60,000 years ago, and it is likely that rock art was created there from that time onwards. The chances that any of the earliest art has survived to the present time are remote, but some of the cupule sites in northern Australia are likely to be several tens of thousands of years old (Bednarik 1993*b*), notably in the Pilbara region (Bednarik 2001). Very deep cupules also occur in dark limestone caves of southern Australia, where they suffer little deterioration. Although no age estimates are available for them, I have provided a minimum age of 28,000 years for simple line petroglyphs in Malangine Cave, through uranium-thorium analysis of a calcite deposit covering them.

No rock art of such antiquity is expected to exist in North America, but it is interesting that a similar pattern has been observed among its early rock art traditions. Several authors agree that the earliest surviving petroglyphs in

various regions seem to be either cupules, or 'pit-and-groove' marks (cupules and linear abrasions). Heizer and Baumhoff (1962) propose that the latter form the oldest rock art in the Great Basin, and Parkman (1992) suggests a pre-Hokan provenance of some cupule traditions in western North America, i.e. that they are of the final Pleistocene. Cupules occur in much of North America, but they are especially common in the west (Baumhoff 1980; Nissen, Ritter 1986). They are found in Mexico (Mountjoy 1987), and a cup-and-groove boulder has been reported from Panama (Stone 1972: 101).

Corresponding patterns can also be observed among the most archaic petroglyphs in South America (Bednarik 1989). The oldest 'dated' petroglyphs of that continent, simple lines, are apparently in excess of 10,000 years old, in Cueva Epullán Grande, western Argentina (Crivelli, Fernández 1996), and cupules occur at the same site. The deeply hammered and heavily weathered dense cupules on the granite boulders at Lungumari Puntilla, southern Peru (Parkman 1994), may also be of considerable age. As in North America, cupules occur in many parts of the continent, but they are generally not dated. Occurrences include those in Guyana, Surinam, Chile and Argentina (Dubelaar 1986).

Cupule sites of Bolivia have recently yielded the first 'direct dating' results from any South American rock art. The first such information has been published from Inca Huasi, near Mizque (Bednarik 2000), to be followed by rock art age estimates acquired from four more central Bolivian cupule sites (fig. 3, *b*).

## TAPHONOMIC LOGIC

In short, there appears to be a worldwide pattern in the occurrence of the earliest rock art. It seems to indicate a great uniformity not only in rock art evolution, but in the specific forms that occur in the earliest phase of rock art production. In addition to cupules and simple linear markings, other very early petroglyphs also show formal similarities: circles and multiple circles, 'trident' designs (often called 'bird tracks', but best described as convergent lines motifs), zigzags and wave lines, multiple arcs and maze designs are widespread, and found with lithics of essentially Middle Palaeolithic technology (Bednarik 1994*a*). But perhaps the most pertinent uniformity is the consistent precedence of cupules, which satisfies the logic of those who look for evolutionary progress in motif designs: the earliest ought to be the simplest. We thus seem to arrive at the conclusion that very early petroglyph traditions were culturally uniform across several continents.

This appearance is particularly reinforced when we consider how this pattern contrasts with that of more recent rock art traditions, those of the final Pleistocene and the Holocene. Wherever one looks, there is a proliferation of different genres, in terms of style, method and distributional characteristics. While



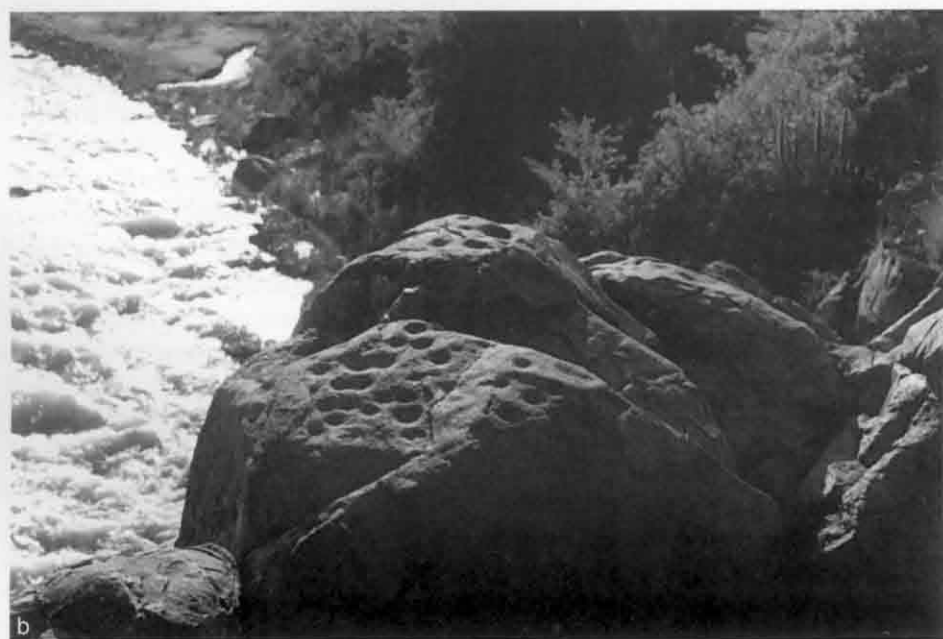


Fig. 3 - *a*, Large boulder with numerous cupules, Pilbara region, Western Australia; *b*, Cupules on quartzite dyke at Inca Huasi, Mizque, Bolivia. They are probably the earliest rock art found in Bolivia so far.

the archaic petroglyphs of the Americas are without exception deeply pounded or incised, simple designs of great uniformity, matching in many ways those of the other continents, more recent art traditions differ greatly from one region to the next. This is such a strong universal, almost global pattern that one is tempted to assume the existence of considerable cultural uniformity among the early cultures, followed by cultural divergence and diversity, particularly with the appearance of colourful painting traditions towards the end of the Pleistocene. Indeed, all rock painting traditions of the Pleistocene seem to occur in well protected places, such as deep limestone caves which experience almost no weathering, or under silica skins in stable sandstone shelters, which has been interpreted as a preference for certain sites. Distribution is thus seen as a cultural factor: the art occurs in deep caves because it was religious, and if any evidence contrary to this popular belief is found, it is explained away. For instance, most of the Palaeolithic human footprints found on the cave floors in Europe are from juveniles, and most of the finger flutings on cave walls in both Australia and Europe were made by children. To the believers, this simply means that the youngsters attended initiation rituals. This is the accommodative way in which orthodox archaeology explains everything in accordance with preconceived dogmas.

It is easy to fall victim to a persuasive combination of empirical data and the consistent deductions drawn from them. Practically all archaeological interpretation is based on 'recognition' of trends and patterns in the evidence, often reinforced by pigeonholing of the raw data or evidence, and their interpretation in accordance with intuitive logic. In my present example, this is probably a deceptive deduction. Far from advocating the view that cupules and simple linear markings represent the oldest rock art made, I emphasise that taphonomic logic implies the precise opposite. It is not necessary to rehearse here the concepts of *metamorphology* as they pertain to rock art (Bednarik 1994*b*, 1995), but I will briefly repeat some underlying rationales. Cupules are usually the deepest pounded petroglyphs we know of, so they are also among the most deterioration resistant. Taphonomic logic demands that any physical characteristic of rock art that may conceivably favour its longevity *must not be considered to be culturally significant*: it must not be seen as defining any artistic preference of technique, style, location or medium. In other words, if the oldest art being found in a region happens to be of a type that is most likely to survive the longest, then there is only a very slim chance that it is indeed the oldest art historically made in that region. It is simply the type of art that had the best prospects of surviving. Indeed, we have evidence that Acheulian people in both India and Europe used pigment pebbles to mark rocks hundreds of thousands of years ago (Bednarik 1994*a*), but we have not found any trace of such drawings, nor are we likely to ever find any of them. The probability that such markings could have survived is almost nil.

Moreover, the effort of producing deep petroglyphs is considerably grea-



ter than that of marking a rock surface with a crayon, and the earliest intentional, non-utilitarian rock markings were probably produced with *little* effort. If we see the occurrence of cupules in the oldest known art in this light it becomes obvious that they are *most unlikely* to have themselves been the oldest art ever produced. The longevity of various forms of rock art (in terms of pigment type, groove depth, location, even motif type) differs enormously, and even more so in differing environmental conditions (geology, moisture, pH, climate). Practically all the variables of such art affect its selective survival, and practically all surviving samples are thus distorted systematically. For instance, painted rock art rarely survives for many millennia, except haematite paintings in sandstone shelters, or paintings preserved by unusual conditions (under silica skins, or in deep limestone caves). Similarly selective deterioration processes apply to petroglyphs. In unsheltered positions, they can only survive from the Pleistocene if they are on exceptionally weathering-resistant rock, or are very deep, or are preserved under some form of case hardening (such as rock varnish). Clearly some types of rock art have vastly greater chances of survival than others, and they are the ones most likely occurring among the oldest surviving traditions. To then assume that they are *typical* of the tradition in question would be illogical, just as it would be to assume that the oldest rock art found in an area represents the oldest tradition that existed there. Almost universally, this should logically be expected to be false.

## DISCUSSION

The global pattern I have described among the archaic petroglyph traditions of all continents is in all probability the result of both cultural and non-cultural factors. It must be cultural to the extent that rock art can only survive if it was made in the first place. But the most important interpretational factor is the taphonomic truncation which age imposes on any corpus of rock art. All 'samples' of rock art are taphonomically skewed, and the extent of this distortion clearly increases with age. Therefore the archaeological practice of treating physical evidence as random samples of whatever activity it is thought to refer to is a fundamental error, and one whose distorting influence increases linearly with the age of the evidence.

Close examination of many taphonomic factors has revealed logical principles that fundamentally challenge orthodox archaeological theory. If we imagine a phenomenon category whose total population increases as a function of time, and which experiences a loss of  $x\%$  per time unit due to taphonomy, it must inevitably reach a point in time when all of the evidence above a certain age should have been exhausted. In practice this is not entirely possible, because

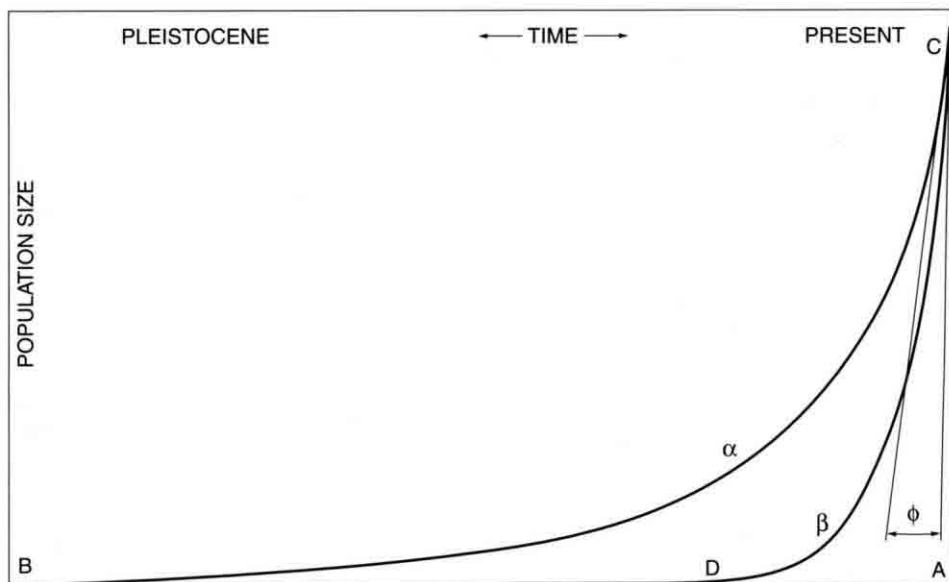


Fig. 4 - Principles of the relationship of total production of an archaeological phenomenon  $s_{\alpha}$  to its surviving instances  $s_{\beta}$  as a function of angle  $\phi$ . These principles are the basis of taphonomic logic.

se the probability of survival can never be nil. Nevertheless, there is a point in time, called the 'taphonomic threshold', which marks the point at which the distribution curve of the surviving population approaches the zero line — but without actually touching it (fig. 4). Beyond that point in time, all the way back to the time when the phenomenon category was first introduced, the curve remains just immediately above the abscissa, and this time period is called the 'taphonomic lag time'.

In taphonomic logic the crucial point to understand is that whatever the loss of an artefact population is per time unit, it must increase as a function of age, hence the taphonomic threshold can never be at the same point in time as the first historical instance of the phenomenon in question. Indeed, for most phenomenon categories the lag time is thought to exceed 90%. So if we rely uncritically on the unrefined 'archaeological record', we will inevitably favour the generation of false interpretations, based as they are on the occurrence, distribution, frequency and form of observed data. The relevance of these quantified data declines with increasing age, back to the taphonomic threshold of the phenomenon in question, at which time all quantitative data about it become meaningless for interpreting the behaviour the phenomenon category is thought to be related to. For instance to then state that there is an absence or

near absence of any kind of evidence is for all practical purposes meaningless.

Every phenomenon category or material class in archaeology is subject to taphonomy and obeys the laws of taphonomic logic, irrespective of whether the object is a snowman made by Neanderthals or a golden vessel — although in these two cases the relevant taphonomic curves would present quite extreme forms. The taphonomic lag, which is crucial in understanding the historical duration of a phenomenon category irrespective of the archaeological record, can in practice range from less than one per cent to more than ninety-nine per cent of the historical duration of the particular phenomenon. Bearing in mind that archaeology has a tendency of ignoring or discounting the rare finds reaching us from a find category's lag time, or explaining them away as a 'running ahead of time' (Vishnyatsky 1994), it becomes apparent that archaeology's interpretations of cultural, technological and cognitive systems, particularly of the Pleistocene, must be expected to be false in nearly all cases. This one theoretical mistake, of not appreciating the significant effects of taphonomic logic, is the greatest single theoretical error archaeology has made in its history. It shows that for all practical purposes, and except in the case of materials of an extremely short taphonomic lag time (most especially sedimentary silicas), the interpretations traditional archaeology has offered about Pleistocene human history must in most details be mistaken.

In looking specifically at rock art, taphonomic logic is a form of logic viewing such evidence as the surviving remnant of cumulative populations that have been subjected to continuous degradation which selects in favour of specific properties facilitating longevity. It does not represent a random sample of a tradition, style or culture. Without an understanding of how lithology, site morphology, micro- and macro-climate, site biology and a host of other taphonomic factors have contributed to selective survival and to alterations of both the appearance and statistical characteristics of the surviving corpora, any archaeological interpretation using variables such as distribution, location, style or technique is doomed to failure.

Cupules were no doubt made very early, beginning with the Acheulian of India, perhaps ten times as long ago as the Aurignacian art of Europe. But it would be very wrong to draw the simplistic conclusion from this evidence that this was a tradition that produced only or primarily cupules. What the cupules do demonstrate, firstly, is the existence of a developed tradition of symbolism, which is likely to have included many other forms of expression. But taphonomic logic, the most powerful theoretical tool ever developed in archaeology, is also capable of telling us that the probability of this artistic tradition having been one of only cupules and other deep petroglyphs is almost nil. This is because it would be an incredible coincidence if the first rock art made was also the most deterioration resistant. It is far more logical to assume that the oldest

surviving rock art survived *because* it was the most deterioration resistant.

Moreover, there is ample other evidence of extremely high cultural sophistication in the Lower Palaeolithic period, contemporary with and even preceding the earliest cupules we know about. We have known for forty years that *Homo erectus* crossed the open sea to colonise several islands, and the early estimates that this occurred up to 830,000 years ago have now been confirmed by different research teams, using different dating methods (Sondaar *et alii* 1994; Bednarik 1997b; Morwood *et alii* 1998). Thus *H. erectus* apparently possessed language and technological sophistication. We know that 400,000 years ago, European hominids made aerodynamically designed hunting spears (Schöningen, Lehringen), and subsequently they produced portable engravings (Bilzingsleben, all in Germany). I have shown that the beads and pendants we have from the Lower Palaeolithic involved not only very sophisticated technologies in their making, but even more sophisticated cognitive and social systems (Bednarik 1997c). They include ostrich eggshell beads of the Acheulian, so the cupules from the same period are not at all unusual or unexpected. They are perfectly consistent with what we know about these hominids, and have known so for some time. After all, with seafaring capability by 850,000 years ago we should assume that language is at least as old, and language certainly is a system of symbols. Whatever non-utilitarian cupules meant at any time in human history, they were an integral part of some symbolic system. They are the oldest artistic monuments of hominids that deterioration processes have left for us to see.

\* *International Federation of Rock Art Organisations (IFRAO) –  
Melbourne, Australia*

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## SUMMARY

Cupules are the earliest surviving rock art we know about in the world, but this does not necessarily make them the first rock art produced. This paper tries to explain the statement just made, by reference to the taphonomy of rock art. The earliest known rock art traditions of all continents are surveyed, and they are briefly considered in the context of other evidence concerning the cognition of early humans.

## RIASSUNTO

Le coppelle sono le più antiche sopravvivenze di arte rupestre conosciute nel mondo, ma ciò non significa che esse rappresentino la più antica arte rupestre realizzata dall'uomo. Il presente lavoro tenta di spiegare questo assunto, con riferimento alla tafonomia dell'arte rupestre. Si procede ad un censimento delle più antiche tradizioni di arte rupestre di tutti i continenti, inserendola brevemente nel contesto di altre evidenze riferibili alla sfera cognitiva della più antica umanità.