Rock Art Research **2010** - *Volume 27, Number 1, pp. 95-120. R. G. BEDNARIK*

KEYWORDS: ***Pleistocene – Petroglyph – Age estimation – Lithology – Australia***

AUSTRALIAN ROCK ART OF THE PLEISTOCENE

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Abstract. The recognition of the occurrence of Pleistocene rock art in Australia is reviewed in the context of historical developments as well as recent observations. The frequency of misinterpretations of reported data and their effects are discussed, with particular emphasis on the traditional heartland of the 'Panaramitee style', in NE South Australia. Despite the continuing paucity of credibly dated examples, it is apparent that most rock art of the earliest phase has survived as petroglyphs rather than pictograms, which is consistent with the evidence from the rest of the world. An attempt is made to characterise Australian petroglyphs that are probably of the Pleistocene, and to estimate their potential number. In comparing them with the Pleistocene rock art of other continents their close similarity with traditions elsewhere belonging to Mode 3 lithic industries is noted.

Introduction

A few researchers have long held the view that some Australian rock art is of the Pleistocene, and this notion amounts in fact to the earliest intimation of a human presence in the continent before the Holocene. It is also the first claim for Pleistocene antiquity of rock art outside of Europe. Archaeological evidence for this idea was secured only more than half a century after it was first mooted. Nevertheless, it was subsequently argued that the claims concerning such early human presence, whilst correct, had been based on questionable data.

The first cohesive proposition of Pleistocene rock art occurring in Australia is almost as old as the general acceptance of Pleistocene art anywhere else (Cartailhac 1902). It was presented by Herbert Basedow (1881–1933), a South Australian geologist and medical practitioner (Fig. 1), who was also an anthropologist, linguist, administrator and explorer. This polymath pioneered rock art research by investigating a series of rock art sites in various parts of his home state and Northern Territory, after his participation with the 1903 South Australian Government North-West Prospecting Expedition, led by Lawrence Allen Wells (Basedow [Welch] 2008). He commenced publishing anthropological papers in 1904. In commenting on the petroglyphs of the Yunta Springs (Olary district) and Red Gorge (Flinders Ranges) sites, he noted that many are found in places where it would now be almost impossible to work, suggesting that major exfoliation of rock mass must have occurred since the designs were made (Basedow 1914). He also noted the ubiquity of accretionary mineral skins over petroglyphs and, being familiar with the fossil megafauna found at Lake Collabonna, he further speculated that a large animal track petroglyph could represent the extinct diprotodon.

Figure 1. *Herbert Basedow, pioneer of Australian rock art research.*

Basedow's extraordinary claims, at a time when Aborigines were assumed to be relatively recent arrivals, were not fully vindicated for much of the 20th century — although a few other investigators reported confirming evidence. Anthropologist, archaeologist and entomologist Norman Tindale (1900–1993) later also visited Yunta Springs and speculated that images of large bird tracks at Pimba, a site near Woomera, could be indicative of megafauna. He considered a series of such tracks, each about 45 cm long, to be of *Genyornis* (Tindale 1951; cf. Hall et al. 1951). Similarly, Robert Edwards (1965: 229) suggested that large macropod tracks on Tiverton Station, just south of Yunta Springs, could represent those of *Procoptodon*. Charles P. Mountford (1929; Mountford and Edwards 1962, 1963) had earlier thought that a complex maze petroglyph at the Panaramitee North site, between Tiverton and Yunta Springs, depicts the head markings of

Figure 2. Petroglyph depicting a yarida *object, Panaramitee North site, the type-site of the 'Panaramitee style' (after Mountford 1929).*

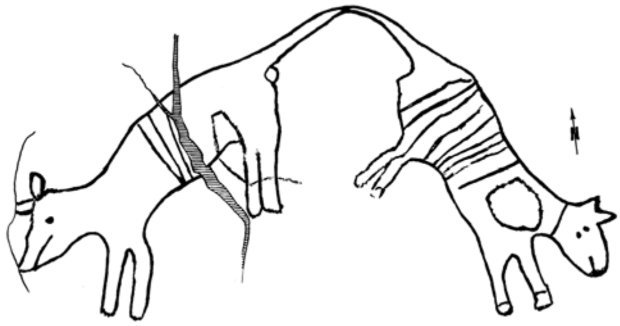

Figure 3. Presumed depiction of a pair of thylacines, Tom Price Site 1, Western Australia, re-discovered and recorded in 1968.

a saltwater crocodile, *Crocodilus porosus*. However, no such species has existed in southern Australia for millions of years. Ronald Berndt (1987) secured a very detailed indigenous interpretation of the complex petroglyph from Barney Waria in 1942, according to which the image depicts a *yarida* magic object (Fig. 2). This is a complex artefact made from wood and string, representing the spirit body of a human being as well as many other things. Mountford and Edwards (1962) also reported what they perceived to be depictions of marine turtle and saltwater fish from Panaramitee North and Yunta Springs respectively. On that basis alone they proposed that these images were created at a time when the 'sea must have been closer to the localities at which the engravings were found, than at present'. The assumed absence of dingo tracks, another of their contentions in favour of Pleistocene age, was subsequently withdrawn by them (Mountford and Edwards 1964).

Most Australian megafauna had disappeared by around 20 000 years (20 ka) ago, therefore depictions of such extinct species or their tracks would have to be of considerable antiquity. The objection to these interpretations, apart from the essentially refuted 'crocodile head' from Panaramitee North, is that they depend upon iconographic interpretation, an essentially unfalsifiable form of argument, and on the proposition that track sizes are intended to be realistic. Aboriginal rock art, however, comprises intricate and numerous mythological elements, and a literal Western reading is known to fail most of the time (Macintosh 1977; cf. Megaw 1983). Nevertheless, others have made more claims of imagery supposedly of Pleistocene animal species in recent decades. Among them are the suggestions of the depiction of extinct megafauna by Percy Trezise (1993) in Cape York Peninsula; of George Chaloupka in Arnhem Land (Murray and Chaloupka 1984); and by Akerman (1998) and Akerman and Willing (2009) for the Kimberley.

While it is not possible to conclusively exclude the possibility that Pleistocene Australians depicted extinct fauna or their tracks, the likelihood of this is remote, primarily because we lack any convincing evidence that figurative depiction was used at the time most megafauna still existed. The only extinct Australian animal species, whose identification in rock art can reasonably be accepted, at least in a number of clear enough cases, is the thylacine. Its imagery has been reported from the Pilbara and Arnhem Land (Brandl 1972; Wright 1972; Bednarik 1974). Some of these images are of very naturalistic appearance and seem to show a good number of presumed diagnostic features (Fig. 3). However, the species survived in Western Australia at least until 3300 years ago (in Murra-el-elevyn, Partridge 1967; cf. Thylacine Hole, Lowry and Lowry 1967), and locally probably well beyond that. Its extinction on the Australian mainland is attributed to the mid-Holocene introduction of the more competitive dingo; hence pockets of surviving thylacine populations could have existed well into the late Holocene. For instance the level of repatination of the many supposed thylacine depictions in the Dampier Archipelago places them well within the last three or four millennia. Geological observations are far more relevant to the question of Pleistocene rock art than iconographic speculations, and Basedow's initial observations concerning geological processes postdating petroglyphs at specific sites are perhaps more pertinent than the subsequent contemplations of motif interpretations.

The proposition of a Pleistocene age of the cave art in Koonalda Cave, on the Nullarbor karst of western South Australia (Gallus 1968, 1971, 1977, 1986), also failed to find full acceptance by mainstream archaeologists, although here the circumstantial archaeological evidence presented was fairly comprehensive. Since no rock art covered by Pleistocene sediment was reported until the late part of the 20th century (Rosenfeld 1981), and no direct dating method was applied to rock art anywhere in the world until that same time (Bednarik 1981), the notion of Ice Age rock art remained until then contentious in Australian archaeology. However, in the following few decades, numerous unfounded and excessive claims appeared like mushrooms across the country, in a development demonstrating that history tends to repeat itself. A century earlier, the Pleistocene age of Spanish and French rock art had initially been strenuously rejected by the archaeological establishment of Europe, until the evidence in its favour became simply overwhelming. Since then, a tendency has developed to attribute any rock art zoomorph in south-western Europe to the Upper Palaeolithic period — particularly equine and bovine images (Bednarik 2009a). Many of these recent petroglyphs did in fact not even exist when Cartailhac (Fig. 4) wrote his famous *mea culpa* (Bednarik 2009b). Australia experienced a similar development: after strenuous rejection of Pleistocene antiquity, its eventual acceptance led to many excessive claims. It is one of several purposes of this paper to analyse these together with the misconceptions that spawned them, and to establish a more reliable knowledge base for Pleistocene rock art in Australia.

Figure 4.
Émile Cartailhac in 1872.

Fallacies about rock art age

Most of the published errors about the age of Australian rock art seem to be related to simple misapprehensions concerning geochemical and geomorphological issues. Perhaps most consequential among these is the question of organics found in rock substrates at or near rock art. The ubiquity of organic matter in rock weathering or saprolite zones, accretionary deposits and even in the putatively unaltered rock fabric was demonstrated at petroglyph sites in the 1970s (Bednarik 1979). This work also showed that the exponential increase in organic substances towards the surface, at the sub-millimetre scale, indicates that the carbon system in most lithological regimes is an *open system*. This means that it remains open to contamination by many factors (microbial action, organic compounds, aerosols) that can significantly affect the concentrations of the carbon isotopes. Yet in many subsequent endeavours of estimating the ages of rock art, this important factor was ignored, much to the detriment of such work. The most comprehensive of these efforts was perhaps the work of Ronald Dorn (1983, 1986, 1990, 1992, 1994; Dorn et al. 1992; Dorn and Whitley 1984; Nobbs and Dorn 1988).

Dorn sought to estimate petroglyph ages by analysing rock varnish covering such rock art in the United States and Australia. In the method he had developed, cation-ratio analysis, the more soluble cations (Ca and K) are compared with the supposedly more stable Ti presence. To calibrate the leaching process, carbon isotope samples for AMS analysis are obtained from near the petroglyphs in question (the damage caused by AMS sampling prevents sampling of the varnish on the actual petroglyph). His work in the Olary district of South Australia, in the very same region where Pleistocene ages were first proposed for Australian rock art, yielded spectacular results at several sites. Proposed petroglyph ages ranging up to about 45 ka were reported (Nobbs and Dorn 1988; Dorn et al. 1992). However, beginning with the debate of the 1988 report in this journal, the reliability of cation ratio analysis began to be questioned (e.g. Bednarik 1991; Bierman et al. 1991; Watchman 1992a) and Dorn conceded that it 'is an inferior method', susceptible to an 'excessively high number of variables' (Dorn 1994; for a list of these variables, see Bednarik 2001a: 141–2). An attempt to duplicate some of the Olary results on the same motifs (Fig. 5) with the same methods yielded entirely different indices (Watchman 1993). This eventually led to the retraction by Dorn of all his results spanning fifteen years, after a 'change of perception' (Dorn 1996a, 1996b, 1997; cf. Beck et al. 1998). However, Dorn's errors were entirely avoidable; this author had in 1987 sent him the 1979 paper in which the openness of the carbon system in rock substrates and the randomness of carbon presence had both been demonstrated.

Nevertheless, the same issue has plagued many other rock art dating efforts and remains deeply entrenched in the views of archaeologists, right up to the present time. At the time of writing this paper, a newspaper reported the view of a prominent Australian archaeologist that '[w]e can't date the [Dampier] petroglyphs because there is nothing organic about them'. This kind of view remains widely held, yet it is doubly untenable: not only organic matter, but certain minerals, even steel, can be radiocarbon dated; yet by the same token, the carbon age of a rock substrate should not be expected to reflect the age of a related petroglyph, so it is irrelevant in any case. Unfortunately it is difficult to correct these notions of archaeologists, and their effects are evident in many examples. For instance, the AMS carbon isotope results Loy et al.

Figure 5. *Rapidly eroding petroglyph panels at Karolta 1, a site where motifs sampled by Dorn were re-sampled by Watchman within a few years, yielding entirely different results.*

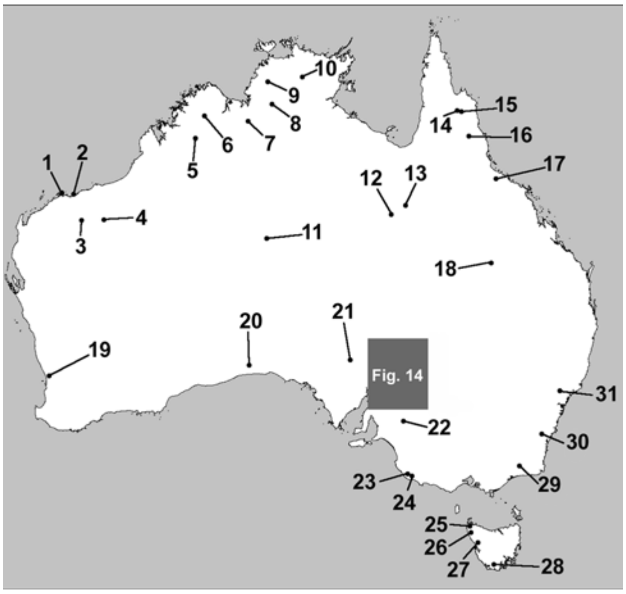

Figure 6. Map of Australian rock art sites mentioned in the text. For inset map (Olary-Flinders Ranges), see Figure 14.
1 – Murujuga/Dampier; 2 – Depuch Island; 3 – Pilbara; 4 – Spear Hill-Abydos complex; 5 – Tangalma/Carpenters Gap Shelter; 6 – Kimberley complex; 7 – Jinmium; 8 – Ingaladdi; 9 – Laurie Creek; 10 – Kakadu complex; 11 – Puritjarra and Wanga East; 12 – Carbine Creek; 13 – Saxby Waterhole; 14 – Sandy Creek Shelter; 15 – Early Man Shelter, 16 – Walkunder Arch Cave 17 – Turtle Rock; 18 – Ken's Cave; 19 – Orchestra Shell Cave; 20 – Koonalda Cave; 21 – Pimba; 22 – Devon Downs; 23 – Karlie-ngoinpool, Karake, Prung-kart, Malangine and Koongine Caves; 24 – Paroong and Yaranda Caves; 25 – Preminghana; 26 – Sundown Point; 27 – Trial Harbour; 28 – Judds Cavern; 29 – New Guinea 2 Cave; 30 – Gnatalia Creek and Waterfall Cave; 31 – Mt Yengo Rockshelter.

(1990) reported from what they claimed was blood haemoglobin at two sites, Judd's Cavern in Tasmania and Laurie Creek in Northern Territory (Fig. 6), is of no value to dating these motifs. The principal analyst of that team, Earle Nelson, reported having 'second thoughts' about these results and returned to Laurie Creek for more detailed analytical work concerning the 'date' of 20 320 + 3100 / -2300 years BP. He found that the reported pigment layer was in fact naturally precipitated iron oxide of a type frequently occurring on the weathered sandstone, and that its organic content comprised no proteinaceous matter, i.e. no blood residue (Nelson 1993). Although Loy (1994) continued to claim that mammalian IgG was present at the sampling site, his view has been refuted by Gillespie's (1997) subsequent research (see also Tuross and Barnes 1996). Loy's insistence that there was organic matter present is not relevant, because, as noted above, practically all rock substrates contain natural organic compounds.

AMS analysis of Australian rock paintings was introduced by McDonald et al. (1990) who applied it to charcoal pigments at Gnatalia Creek and Waterfall Cave in New South Wales. Two results from what is clearly a single motif at Gnatalia Creek, taken just a few centimetres apart, differ dramatically: 6085 ± 60 BP (AA-5850) and 29 795 ± 420 BP (AA-5851). The most likely explanation for these profoundly incompatible results is again that they reflect the open carbon system of the substrate (Bednarik 1979), which questions the integrity of all such carbon isotope results. Alternative explanations for these contradictory results are possible, however.

Other misunderstandings about the age of rock art abound in the archaeological literature of Australia. For instance, several authors claim incorrectly that Dragovich (1984a, 1984b, 1984c, 1984d, 1986) has dated or minimum-dated rock art at Eight Mile Creek, a locality near the Sturts Meadows Station in western New South Wales (e.g. Clegg 1987: 241, 1992: 32; Franklin 1991: 124; Lourandos 1997: 121; Morwood 2002: 133). Yet Dragovich states unambiguously that her samples were from rock that was not engraved (e.g. Dragovich 1984a: 53). Moreover, her bulk samples of pedogenic, reprecipitated carbonate are most unlikely to yield valid precipitation ages, again for the reasons cited above.

Morwood attempted to provide a maximum age for the petroglyphs on a boulder he excavated in Kens Cave, Queensland, but his illustration of the stratigraphy (Morwood 1981: Fig. 7) shows that he misread the section: the engraved boulder rests on Layer 1, which is overlain by 2a, therefore the rock-fall cannot postdate sample ANU-2118, being from 2a. Clarke (1978) attributed the rock varnish covering many petroglyphs of the Dampier Archipelago in Western Australia to the Last Glacial Maximum, speculating on that basis that some motifs might be over 17 ka old. This assumption lacks scientific justification, and it is contradicted by the calibrated repatination curve secured from another part of the Pilbara region (Bednarik 2009c).

A similar Pleistocene chronology of the Murujuga rock art at Dampier was created by Lorblanchet (1992), based on a single, questionable carbon isotope analysis of a surface seashell, supposedly 18.5 ka old. This object, at the Gumtree Valley site (one of 572 Murujuga sites re-discovered by the author in 1967–1970), had no demonstrable relevance to the site's rock art and its presence, more than 100 km from the nearest coast at LGM sea levels, remained unexplained. Based on their degree of repatination (Fig. 7), the great majority of Dampier petroglyphs are under 4000 years old (Bednarik 2001b, 2007, 2009c: Fig. 9). Nevertheless, Ken Mulvaney has recently revived the notion of Pleistocene rock art at Dampier, but so far again without presenting testable or credible data. Unsuccessful endeavours to locate petroglyphs at Murujuga below sea level suggest that the massive concentrations of rock art refer to present sea level (Dortch 2002).

The supposedly oldest dated rock painting in the world (cf. Morwood 2002: 19, 37, 141) has been reported from Carpenters Gap Shelter 1 (the site's traditional name Tangalma has historical precedence), in the Kimberley region of north-western Australia. In a deposit yielding occupation evidence of up to 40 ka, O'Connor (1995) reported finding a rock slab she considers to bear ochre, but there is no indication that the coating is of anthropic origin. The shelter has experienced considerable water logging, which is more likely to account for the deposition of iron minerals in the lower sediments. Striated or modified haematite does occur in abundance from the time of earliest known occupation of Australia onwards (Jones 1985; Roberts et al. 1990, 1993; Thorne et al. 1999), and from much earlier times in the Old World (Bednarik 1994a). Therefore it is entirely reasonable to assume that pictograms were produced at that time, but in view of the severe taphonomic truncation of this form of rock art such finds may remain elusive. It is extremely improbable that anthropic ochre traces would survive for tens of millennia in a frequently water-logged sediment of Tangalma.

The perhaps most spectacularly mistaken rock art dating in Australia is that of the Jinmium site in the far west of the Northern Territory (Fullagar et al. 1996). Using TL analysis of sediment, a series of cupules at that site was claimed to date from between 58 and 75 ka ago, and it was even proposed that human occupation of the site began 185 ka BP. These sensational numbers exceed the accepted duration of Australia's colonisation, but they were the result of a misuse of the dating method (Gibbons 1997; Roberts et al. 1998, 1999). Sandstone shelters such as the Jinmium site are subject to laminar exfoliation of rock fragments, which then decompose to sand in the regolith-derived sediment. However, the grains in the interior of these fragments are not exposed to light at the time of their exfoliation, hence bulk sediment samples will yield greatly inflated TL 'ages'. Roberts et al. have convincingly shown that the Jinmium cupules are a Holocene phenomenon.

Less excessive was the suggestion that a red rock painting in the nearby Kimberley region is in excess of 17 ka old, based on a single OSL date from a superimposed wasp nest (Roberts et al. 1997, 2000), but it is also unlikely to be correct. The motif in question is attributed to the gwion gwion tradition (formerly called Bradshaw figures), which is believed to be of mid to late Holocene antiquity (range 1400–4000 years BP, but possibly underestimating the ages of the paintings; cf. Watchman et al. 1997: 25). Considerable difficulties with the interpretation of OSL results have emerged (Bednarik 2001a: 133–4). Recent results by R. Roberts from four sites of the Indian Lower and Middle Palaeolithic are problematic (Bhimbetka, Daraki-Chattan; Bednarik 2008a: 3; and Ghogara, Khuteli; Fenwick et al. 2008):

> Quartz grains do not all behave identically to light and ionising radiation. Very few grains in the study samples proved suitable for OSL dating, so analysis of single grains was necessary [the sediments relate to the Toba ash, i.e. are of known age]. By using various objective rejection criteria, we isolated the quartz grains most suitable for OSL dating. Selection of these grains should enable the most accurate and precise D_e estimates to be obtained (Fenwick et al. 2008).

There are many further questionable claims, some also involving 'portable art' (Dortch 1976, 1979, 1984; corrected in Bednarik 1998a), but it must be emphasised that, despite all these impediments to a sound overview, a great deal of Pleistocene rock art does undoubtedly occur in Australia. However, the question of the possible quantity, nature and distribution of Australian rock art remains to be discussed in any systematic or comprehensive form. Apart from the untenable or dubious claims made since 1981, the principal encumbrance is the wide adoption of Maynard's (1979) tripartite model of Australian rock art and its three consecutive 'developmental phases'. It has hampered the establishment of a credible chronology as much as the archaeological confusions about dating.

Essentially, Maynard and others failed to separate site corpora into chronological components, partly because of Maynard's reliance on Edwards' misinterpretation of repatination rates, as noted below. Site corpora were treated as representing single traditions, when in fact several traditions had often contributed to a given site's repertoire. This conflating of the residues of different traditions has rendered it difficult to address the variable of time effectively (Bednarik 2001a, 2002c). Maynard's system of 'Panaramitee style', followed by 'simple figurative style' and then by 'complex figurative style' is contradicted at countless sites across the continent and is inherently self-contradictory. Often traditions

Figure 7. Petroglyph at Murujuga, Dampier Archipelago, Western Australia, re-discovered in 1968, presumed to depict a thylacine.

Figure 8. Sturts Meadows 'Panaramitee' petroglyphs, photographed in 1971.

of simple figurative motifs are preceded by much more complex figurative motifs (e.g. in the Pilbara), whilst the 'track and circle' 'style' of the Panaramitee can be the earliest or the most recent component of a site. Not only is Maynard's model therefore bereft of any chronological role, the three 'styles' are so loosely defined that they could refer to hundreds of rock art traditions around the world. For instance the author has demonstrated in a blind test that eight leading Australian specialists of the 'Panaramitee style' cannot distinguish between it and the styles of rock art sites in all other continents except Antarctica (Bednarik 1995). This 'style', variants of which could be claimed to exist throughout the world, includes both simple and complex figurative motifs (e.g. at the type-site, Panaramitee North). The 'simple figurative' sites, also a global phenomenon in rock art, are really no different from those defined as being of the Panaramitee style, except in the claimed relative proportion of perceived motif types. And the same can be said about the 'complex figurative style', also including large components of the two other 'styles'. Therefore Maynard's model offers three 'styles' that seem to be distinguished arbitrarily, and that are most unlikely to reflect any chronological order. Her 'Panaramitee style', usually regarded as Pleistocene and sometimes as old as 30 ka, still survives into the present in some parts of the country (Munn 1973); it was still produced in the 20th century in the form of petroglyphs, and can apparently still be detected in contemporary canvas paintings. Her two other 'styles' could be any Holocene age and both have been produced very recently. Maynard did not discount the possibility that her three styles might to some degree overlap chronologically, but later commentators have emphasised their consecutiveness. Clegg (1992) mistakenly claims:

> There are accepted minimum dates [for the Panaramitee style] of 13 000 (Rosenfeld 1981: 51, 88) 10 000, and 4000 (Dragovich 1986) years ago. Cation-ratio dates range from 31 700 to 1400 years ago (Nobbs and Dorn 1988: 112–3).

Much the same is claimed in Clegg (1987: 241–2). Yet Rosenfeld maintains on several occasions that her dating at Early Man Shelter in Cape York Peninsula refers to petroglyphs that do not belong to Maynard's 'Panaramitee style' (e.g. Rosenfeld 1991); Dragovich as noted has not dated any rock art; and all dating claims by Dorn, in two continents, have been withdrawn by him (Dorn 1996a, 1996b) and are universally regarded as erroneous. Clegg maintains as recently as 2009 that the 'Panaramitee' petroglyphs of Sturts Meadows near Broken Hill are 'more than 10 000 years' old, and that most probably they are of the Last Glacial Maximum and 20 000 years old (Clegg 2009). In reality, Sturts Meadows is a large site complex on siltstone of variable degrees of metamorphosis, i.e. a very unstable lithology, and the petroglyphs remain entirely undated (Fig. 8). By comparison to other rock art in the district, which Clegg would presumably include in the 'Panaramitee', and in view of its similarly poor lithological supports it is extremely unlikely that any of the sites' petroglyphs exceed mid-Holocene antiquity (see below).

Another issue with the 'Panaramitee style' is its definition of comprising 60% animal tracks, 20% circles, 10% lines and 10% 'others' (which includes both simple and complex figurative motifs). Nobbs' painstaking study of the very core area of this 'style', the Olary-Yunta region of South Australia, provides detailed motif counts from seventeen of the petroglyph sites (Nobbs 1984: Table 3). Accordingly, the animal track percentages range from 0% to 72%, the circles from 0% to 81%, the lines from 0% to 47%. Another study, of two sites near Mt Isa in Queensland (Morwood 1985), records 41% circular motifs, 42% other 'geometrics', 15% 'tracks' and 2% figurative motifs at Carbine Creek; and 12% circles, 30 % figuratives, no 'tracks', and the rest linear non-iconic marks at Saxby Waterhole painting site. Some of the petroglyph sites in the core area of the purported 'Panaramitee style' comprise >95% circles (e.g. Yanyarrie Creek, Orroroo, Pertawurtina [Dingley Dell], Moolooloo and Burra Sites), while Winnininnie 3, just a few kilometres from Panaramitee North, features >95% abraded grooves, no circles, and just a few 'tracks'. These percentages are therefore essentially random figures, and in fact very few sites in Australia exhibit the prescribed 'ideal' numbers, hence the claim of consistent percentages is as much a myth as the claim that the 'style' has been dated.

The 'track and circle complex' was first proposed in Edwards (1966) and then more fully developed in Edwards (1971). Like most other archaeological misconceptions about rock art ages, the idea of its antiquity involved fallacies concerning lithological context and repatination rates, which is easily seen by considering Edwards' (1971: 361) misquotation of Anati (1963: 18). Writing about the repatination of petroglyphs in the Negev Desert, Anati had stated:

> In this region we know of no engraved surface from

> Style IV-B (Iron Age) to Style VII (recent) with a patination identical to that of the original rock surface. This seems to mean that in this area it took a minimum of 2500 years to reach an '0' shade, the natural color of the patina on the surface of the rock (Anati 1963: 189).

Edwards misrendered this carefully crafted, precise wording by stating that

> no engravings have re-weathered to match the natural dark rock surface. As some of them are associated with the Iron Age, Anati believes it takes a minimum of 2500 years for a thin, initial surface patination to form in the region (Edwards 1971: 361).

He therefore inverted the statement to mean the opposite. Maynard, in following Edwards, then confused the issue further by adding her own opinion to an already erroneous statement:

> Trendall's view [relating to dolerite from Depuch Island], that it takes one million years, seems a little extreme in these circumstances (1964: 88). In a similar situation in the Negev Desert, Iron Age engravings which are approximately 2500 years old have not repatinated to match the surrounding rock (Maynard 1979: 93).

Maynard, in citing Edwards, also confuses or conflates two different and largely unrelated issues here, *weathering front formation* and *repatination*. Weathering is the chemical and physical decay of rocks exposed to the atmosphere extending to a certain depth; patina is a visually obvious surface feature on rock, differing in colour or composition from both the unaltered rock and the weathering zone, and is in most cases attributable to an accretionary deposit. Trendall's findings refer to his data of the depth of the weathering zone or 'weathering rind' (saprolite zone), which is the substrate that has been altered by weathering processes, such as hydration. His estimate was not only correct in terms of order of magnitude, it was even confirmed independently by the more precise work two years later of Černohouz and Solč (1966), who arrived at their determinations without knowledge of Trendall's work, but whose results match those of Trendall (see analyses of Trendall's results in Bednarik 1979, 2007): a weathering zone of 5 mm on basalt corresponds to 1.1 Ma in central Europe. Trendall had stated that a weathering zone of 0.2 inches thickness (~5 mm) requires over 1 Ma to form. Maynard then quotes Edwards' citation of a statement originally by Anati, concerning the time taken by the full repatination of a petroglyph, which Edwards had misunderstood. (In a similar case, concerning Saharan petroglyph repatination, Mori had made the same error earlier, but corrected himself [Mori 1974: 89–90] by retracting a statement he had made [Mori 1965: 63], and substituting '*quasi scura quanto*' for '*tanto scura quanto*'.)

Maynard's misunderstandings are in addition to a previous failed attempt (Crawford 1964: 50; see Bednarik 1979: 22 for correction) of interpreting Trendall's unambiguous and impeccably presented data. These and other misapprehensions have resulted in derivative misguided views and discussions, such as a debate concerning the effects of groove depth (or, more precisely, distance between groove bottom and weathering front) on repatination rates (see Bednarik 2007: 223).

Figure 9. *Koonalda Cave finger flutings, photographed in 1979.*

Unfortunately, age estimation of both petroglyphs and pictograms remains difficult and generally experimental, and over-interpretation or misinterpretation of scientific dating pronouncements is rife in archaeology (David et al. 1995; Bednarik 1996, 2002c; Watchman 1999). In hundreds of cases, statements referring to rock art dating have been misunderstood or even completely inverted; in others scientific information has been misquoted or systematically misinterpreted. In the generic question of Pleistocene antiquity of Australian rock art, the present state of misinformation is such that it may require decades of patience to displace the structure of falsities and half-truths that archaeology has created.

Reviewing the empirical evidence

The first archaeological and conservative (Holocene) minimum datings of Australian petroglyphs were secured at Devon Downs (lower Murray river; Hale and Tindale 1930: 208–211), Ingaladdi (Queensland; Mulvaney 1975: 185) and Preminghana (formerly Mt Cameron West; Mulvaney 1975: 170). At Ingaladdi, exfoliated petroglyph fragments were excavated from layers radiocarbon dated to 4920 ± 100 BP (ANU-58) and 6800 ± 270 BP (ANU-60) respectively. The first substantive but still indirect evidence for a Pleistocene antiquity of Australian rock art was secured in Koonalda Cave (Fig. 9), on the Nullarbor karst plain (Gallus 1968, 1971, 1977, 1986; Maynard and Edwards 1971). Carbon isotope dates from excavated and surface charcoal samples range roughly from 15 ka to 31 ka, and although none can be directly related to the extensive cave art, circumstantial evidence implies that the cave was not visited in the Holocene. The

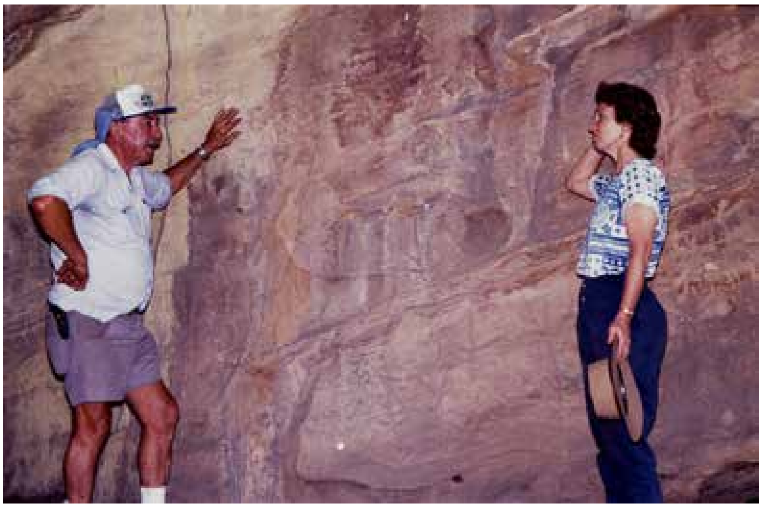

Figure 10. *Early Man Shelter in 1991, with two Australian pioneers of rock art research: Percy Trezise, who re-discovered the site, and Andrée Rosenfeld, who minimum-dated some of the rock art to the final Pleistocene.*

huge entrance sinkhole renders human access extremely difficult today, and the remains of apparent Pleistocene torches and the considerable ceiling breakdown succeeding the finger flutings production all imply a Pleistocene antiquity for the human activity traces in the large cave. Moreover, carbon sample V-92, of 19 900 ± 2000 BP, is from the surface deposit in front of the Squeeze (a narrow extension of the Art Passage), which places it on top of the huge rockfall deposit that commences at the Gallus Site. It is clear that many finger flutings extend up to several metres below the top of this feature, observable through small openings between the blocks; therefore a minimum age of 20 ka probably applies to at least some of the cave art (Bednarik 2006).

More secure is the minimum dating of a series of petroglyphs at Early Man Shelter (Fig. 10), near Laura, Cape York Peninsula (Rosenfeld 1975, 1981; Clouten 1977). The sediment covering the lowest examples of rock art at that site was in the order of 13 to 15 ka old, which finally established a reasonably unambiguous Pleistocene antiquity for Australian rock art (but see Cole and Watchman 2005 for pertinent queries). In the year this finding was presented, 1981, the first *direct dating* (Bednarik 2001a: 124) results from rock art were acquired in Malangine Cave, South Australia (Bednarik 1981, 1986). From a sequence of three chronologically discrete traditions separated by speleothem stratigraphy, conservative minimum carbon isotope estimates of the early Holocene were obtained for the second of these temporal units (Bednarik 1981, 1984). However, uranium-thorium analyses of one of the deposits suggested in 1982 how conservative these estimates were: the cave art tradition in question was suggested to be in excess of 28 ka old (Bednarik 1999). It is attributed to the non-figurative 'Karake tradition' of cave petroglyphs (Fig. 11), which features arrangements resembling petroglyphs found on the other side of Bass Strait, at NW Tasmania, e.g. at Preminghana (see below). There they are of unknown antiquity, but are thought to have become buried by beach sand c. 1500 years ago. Tasmania became sundered from the mainland about 12 ka ago, therefore if the occurrences on both sides of the Strait were culturally connected, the tradition would need to extend into the Pleistocene.

Figure 11. *Petroglyphs (CLMs and isolated cupules) on the ceiling of Malangine Cave in 1980, the subject of the first direct dating of rock art in the world, which yielded ^{14}C and Th/U results placing the petroglyphs in the Late Pleistocene.*

Direct dating via carbon isotope determinations from laminated calcium carbonate precipitates has been secured from another of the many cave art sites near Mt Gambier, Prung-kart Cave, but here the rock art was only in excess of 2500 years old (Bednarik 1998b). Nevertheless, many of the cave art finds of the area can safely be assumed to include Pleistocene elements, as indicated by context. For instance the finger flutings in Yaranda Cave predate sets of megafaunal claw markings, and substantial speleothems have often been deposited over Australian cave art, or major tectonic changes have occurred since it was executed (Fig. 12). Concerning the possible age of Tasmanian cave art, it has been suggested that pictograms in Judds Cavern and Ballawine Cave were probably painted before 11 ka ago (Cosgrove and Jones 1989: 100), although this, too, is based on circumstantial evidence only.

Watchman developed the direct dating of rock art by extending it from carbonates to silicas and particularly oxalates, securing the first carbon isotope results from the latter type of accretionary deposits (Watchman 1990). Although his initial determinations were of the Holocene, up to 8880 ± 590 years BP (from Kakadu National Park), he also demonstrated the repeated paint applications at various sites at earlier times, sometimes even finding paint residues embedded in mineral skins that showed no trace of pigment on the surface (Watchman 1992b). Such stratified accretions on a flake yielded oxalate 'dates' (or minimum dates) ranging up to about 24 600 years from Sandy Creek Shelter 2, near Laura, Cape York Peninsula (Watchman 1993). The nano-stratigraphic sequence from another northern Queensland site, Walkunder Arch Cave, provided comprehensive dating of finely stratified whewellite and gypsum crusts (Watchman and Hatte 1996; Watchman 2000; Campbell 2000). In this case, ten carbon dates were secured from laminae measuring a total thickness of only 2.11 mm, but spanning the period from 3340 ± 60 to 29 700 ± 500 years BP. All dates were in sequence, and three of them denote painting episodes, ranging in age from about 10 ka to 28 ka. More recently, and Watchman (2005) reported further oxalate AMS dates from Cape York Peninsula, suggesting that cupules and curvilinear petroglyphs at Possum B and Sandy Creek Shelter 1 are of the Pleistocene.

Microerosion analysis is difficult to apply in Australia, because in contrast to Eurasia, historically dated stone surfaces suitable for local calibration (e.g. monuments, gravestones, inscriptions or structures) older than about 200 years are not available. The method of calibrating the development of micro-wanes on broken crystals (most often of quartz), one of the microerosion methods, requires the availability of impacted surfaces of known age from the same environmental zone (Bednarik 1992). When a cluster of many dated inscriptions was found amidst one of the largest concentrations of petroglyphs, in the eastern Pilbara, a calibration curve they yielded became available for application to a selection of nearby motifs (Bednarik 2001b, 2002a, 2002b). The two oldest dates of a randomly chosen sample of seven in the Spear Hill/Abydos area were about 20 ka and 27 ka respectively (Fig. 13). However, it was clear from the relative weathering state that there were significantly older motifs present nearby. Most especially, boulders bearing numerous cupules of clearly greater age were observed, confirming what has been reported by many in Australia (and elsewhere): that the earliest surviving forms of rock art seem to be dominated by this phenomenon (Bednarik 1993, 2008b).

Although the existence of Pleistocene rock art is thus well established in Australia, its extent still remains to be determined, and to facilitate its cognisance it is requisite to explore its formal characteristics. This is also essential for the creation of a credible formal chronology, which so far has remained elusive. Without such a prescriptive basis, more capricious claims similar to those listed in the previous chapter are bound to appear in future, and more time and effort will be involved in refuting them. The first step in creating an equitable but effective *terra firma* for the subject of this paper must be to counter the ahistorical design of Maynard's tripartite precept, which the author will shortly attempt elsewhere. Here he is more concerned with reviewing the historical claims made up to 1980, and it is at once evident that they relate exclusively to South Australian sites. In fact nearly all such references address the general region between the Flinders Ranges and Olary, which therefore deserves special attention here.

Figure 12. *Fossilised finger flutings in Yaranda Cave, which predate megafaunal scratch marks, tentatively attributed to* Thylacoleo*; photographed in 1993.*

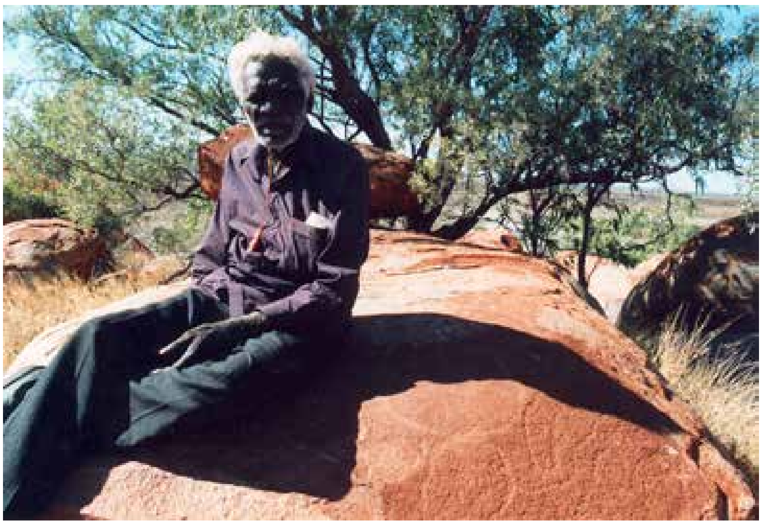

Figure 13. *Traditional custodian Monty Hale requested that the age of the curvilinear petroglyphs he is seated next to be estimated by the author. The rock art, at Woodstock site 65B, Western Australia, is between 16 000 and 26 500 years old. Older rock art occurs a few metres from it.*

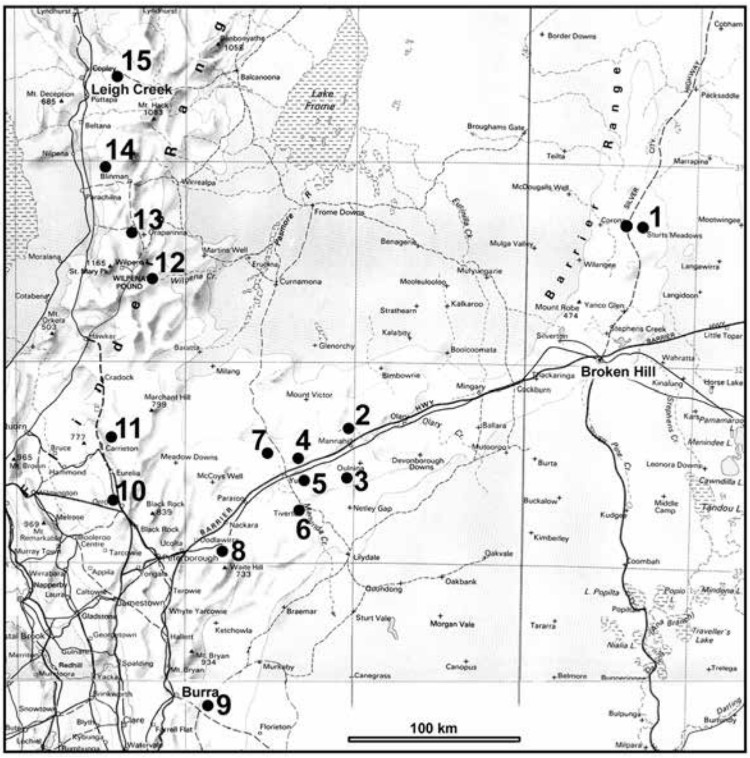

Figure 14. Map of the Olary-Flinders Ranges rock art region, with some of the key petroglyph sites shown.
1 – Sturts Meadows/Eight Mile Creek, Euriowie; 2 – Karolta 1; 3 – Morialpa; 4 – Winnininnie 3; 5 – Panaramitee; 6 – Tiverton; 7 – Yunta Springs; 8 – Manunda Springs; 9 – Stone Chimney Creek; 10 – Orroroo; 11 – Yanyarrie Creek; 12 – Sacred Canyon; 13 – Pertawurtina; 14 – Moolooloo; 15 – Deception Creek/Red Gorge.

The Olary – Flinders Ranges region

The historically first proposition of Pleistocene antiquity of Australian rock art, by Basedow, is of particular significance, because it is also the first qualified claim of a human Pleistocene presence in Australia. Basedow's evidence comprises four parts: the presence at two sites of petroglyphs high up on cliff faces that are today inaccessible; the occurrence of detached 'tumbled blocks of rocks found in the valley below, bearing part of a design, the other portion of which remained in situ on the cliff above' (Basedow 1914: 198); the presence of dark patina or glaze on petroglyphs; and the possibility of 'tracks' being of extinct megafauna species. The first site he refers to, Yunta Springs (Fig. 14), is a relatively compact assemblage of petroglyphs in a deeply-cut, short valley, which facilitates the ready identification of the evidence Basedow cites. The high motifs he mentions occur on the western side of the creek bed, on just a few exposures (Fig. 15). The site consists principally of sub-schistose phases of metamorphic, primarily dolomite-cemented siltstone facies, dominated by the phyllite phase, readily recognisable by frequent wavy structures. However, there is also a sub-horizontal sandstone lens of about 40 m length and up to a few metres thickness. Of poor mechanical strength because of its large interstices, it comprises well-sorted, rounded and frosted grains, mostly in the 500–800 microns fraction. The section reveals distinctive cross-bedding, and it is the removal of blocks of this sandstone by the creek that has rendered Basedow's petroglyphs on the phyllite above inaccessible. Unless the makers of the high motifs used some form of scaffolding, such as trees, to gain access, the present surface of the sandstone seam has to postdate the event of rock art production. Unfortunately it does not seem to offer any means of dating the time of exposure. The probability that scaffolding was used is low, because typically all rock art at these sites found on vertical surfaces occurs at levels of convenient access from rock ledges. The issue thus focuses on the question, at what time were the rock ledges of sandstone destabilised by the creek and claimed by gravity. Although that remains unanswered, the author is sceptical of the Pleistocene antiquity of the high motifs.

Basedow's second mention of high petroglyphs, at Red Gorge, has not so far been verified. The sites at

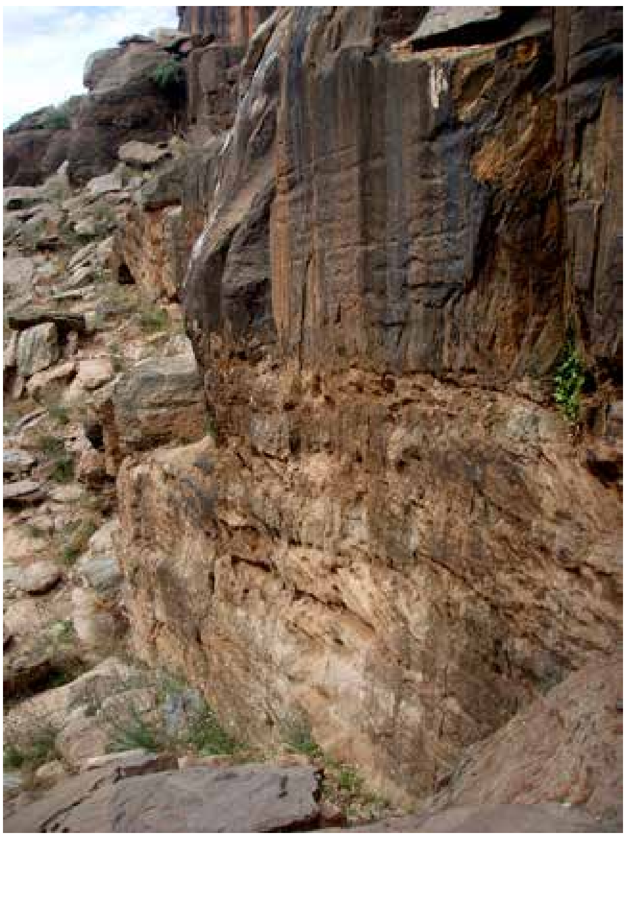

Figure 15. Yunta Springs, South Australia, view of the western cliffs. The sandstone lens in the lower half of the image has been truncated since the petroglyphs, occurring on the overlying phyllite, were made; hence the face of the sandstone postdates this rock art.

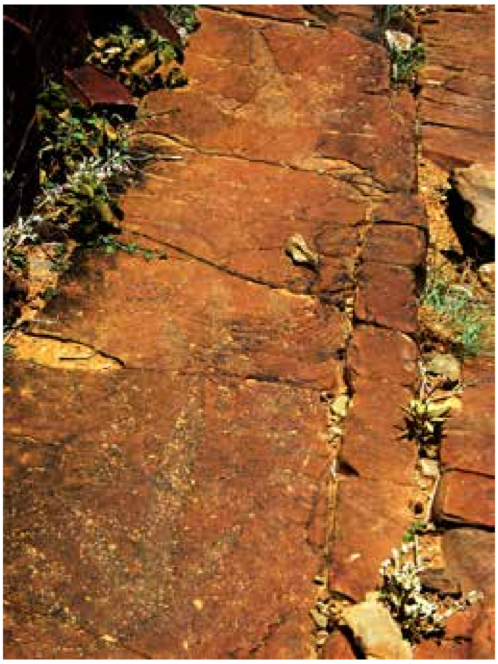

Figure 16. *'Large bird tracks' at Deception Creek Site. Photograph by Livio Dobrez.*

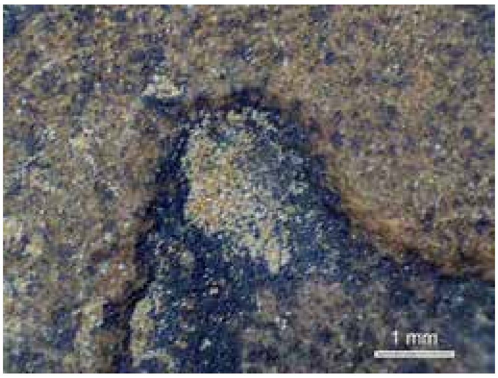

Figure 17. *Microphotograph of one peck mark forming part of a 'large bird track', showing the perfect preservation of the fracture edges. Note manganese deposit, preferentially forming in the impact pit. Deception Creek Site.*

Deception Creek, in the northern Flinders Ranges near Copley, occur along a series of extensive cliffs, but a search by participants of the AURA fieldtrip in October 2009 failed to locate any motifs that are not at present accessible, although some rock climbing skills are required in a few instances. A detailed examination of two '*Genyornis* tracks', one of which measures 45–46 cm — the size Tindale (1951) reports from Pimba — revealed that this attribution cannot be upheld (Fig. 16). *Genyornis newtoni* is thought to have become extinct between 45 and 55 ka ago (Miller et al. 1999), yet the

Figure 18. *' Large macropod tracks', among several found at the Tiverton main site.*

Deception Creek 'large bird tracks' are certainly of the late to final Holocene. The very weakly metamorphosed, fine-grained and well-sorted sandstone contains almost no particles above 50 microns, which renders it unsuitable for microerosion analysis. However, microscopic examination suggests very limited surface deterioration and granular exfoliation, combined with an absence of any indication of surface retreat. Individual peck-marks remain well preserved, and the edges of the pecked areas still show the well-sculpted micro-edging and flake scars deriving from the impact (Fig. 17). In this lithological and erosive regime it is unlikely that these motifs would exceed an age of two or three millennia. Moreover, as already noted by Mountford and Edwards (1964: 857), the occurrence of what are considered to be dingo tracks at Red Gorge would also favour a late Holocene age.

Similarly, none of the other 'large tracks' attributed to megafauna that have so far been examined seem to predate the late Holocene, including certainly Edwards' several conjectural '*Procoptodon* tracks' at Tiverton (Fig. 18). Like all of the region's 'Panaramitee-style' petroglyph sites, the lithology of that large site complex with its thousands of motifs has no prospects of preserving Pleistocene rock art. With a few notable exceptions, all petroglyphs of the Yunta-Mannahill region occur on metamorphic phases of fine-grained sedimentary rocks of the Precambrian Adelaide System (Ludbrook 1980), including dolomitic siltstones, mudstones and tillites — among the exceptions being one rock at Morialpa Petroglyph Site, of micaceous schist (Nobbs 1984: 101); the Winnininnie 3 site, in well-developed slate deposits; and localised facies reaching the schist phase. What all of these rocks have in common is that it is easy to produce both percussion and abrasion petroglyphs on them, but they offer little substrate stability, particularly those that are of high carbonate content. In the presence of carbon dioxide, the carbonate reacts with water to form soluble bicarbonate. As the dark-brown accretionary veneer is breached, the clay minerals are also vulnerable and the substrate becomes physically unstable and exfoliates.

Other relevant information derives from sites where petroglyphs occur in stream channels and have been subjected to kinetic abrasive

Figure 19. *Petroglyph right on the thalweg of the Yanyarrie Creek, showing typical wear by suspended load, with a Degree of Erasure of 25%.*

Figure 20. *Circle, 'bird track' and 'macropod track' petroglyphs at Manunda Springs Site. The locations of three analysed quartz grains in the 'bird track' and one in each of the two parts of the 'macropod track' are indicated by the markers. Three of these grains yielded microerosion data.*

wear by suspended load. This has occurred for instance at the Yunta Creek, Stone Chimney Creek and Yanyarrie Creek Sites. Such wear can be by bedload abrasion or the impact of suspended-load abrasion (Alexander 1932; Foley 1980; cf. Sklar and Dietrich 1998; Snyder et al. 2000). Hartshorn et al. (2002) have shown that small grains of diameter $d \leq 2$ mm can travel in significant numbers up to a flow depth of 4–6 m in turbulent suspension, far in excess of what can be expected in the study area. Such grains can be responsible for significant bedrock abrasion (Hartshorn et al. 2002: Fig. 3A), in particular if a soft lithology is exposed such as that found at all petroglyph sites between the Flinders Ranges and Broken Hill. Schist, which is considerably harder than mudstone or siltstone, has been shown to be up to two orders of magnitude more erodible than quartzite or granite (Attal and Lavé 2006: 156, 159). The principal variables in the effectiveness of these processes are kinetic energy, turbulence and the composition of the abrasive. The Yanyarrie Creek sediment, at the site near Carrieton (Fig. 19), is almost entirely free of quartz, whereas the active sediment at the Stone Chimney Creek site east of Burra does contain some quartz. This is reflected in the Degree of Erasure found on the petroglyphs affected. Based on the quantitative data from Siega Verde in western Spain (Bednarik 2009b), with a regime of much greater kinetic energy and far more effective abrasive, it can be estimated that the petroglyphs at the South Australian sites affected by fluvial erosion are very probably less than 3000 years old.

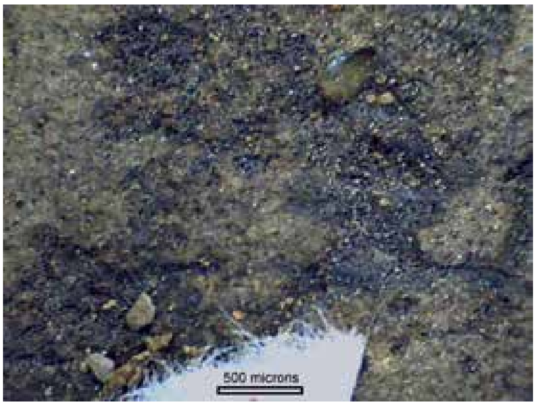

Figure 21. *Microphotograph of one of the fractured quartz grains in the 'bird track' motif at Manunda Springs, showing the curved edge of the fractured grain that provided ten micro-wane widths* A *(on the far left in Fig. 20).*

Manunda Springs, about 8 km north of Pitcairn Station, includes a small concentration of petroglyphs on a single outcrop of well-metamorphosed siltstone that contains occasional but rare quartz grains of the sand fraction. These are rounded and frosted (pre-deposition surface), range from 250 to 700 microns in size and occur in scattered groups in a matrix of $d \leq 50$ microns fraction. Scanning of several petroglyphs yielded such particles in two of them (Fig. 20), a 'bird track' motif (three grains) and an adjacent 'macropod track' (two grains, one in each half of the 'track'). One of the grains in the first motif and both grains in the second offer fractures of roughly 90° (see Bednarik 1992 for details of method), which provided respectively 10, 13 and 6 micro-wane width A measurements, forming well-defined clusters (Fig. 21). As there is no

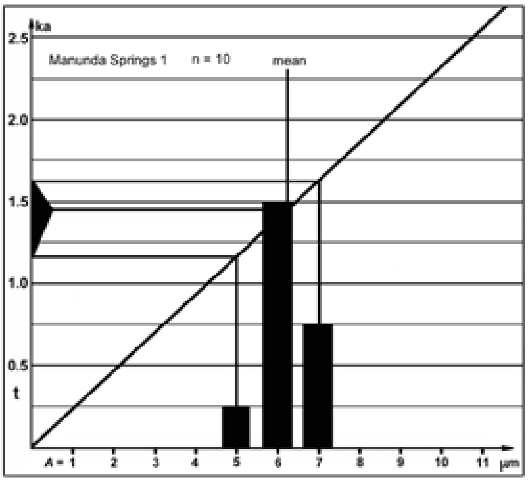

Figure 22. *Manunda Springs 'bird track' motif, microerosion analysis, using the Spear Hill calibration curve.*

calibration curve available for the region, and since the values are relatively low, the Spear Hill calibration curve (relating to reasonably similar climatic conditions; Bednarik 2002a, 2002b) can be used to obtain a *tentative* estimate of these motifs' absolute ages. They are both surprisingly young but, despite being adjacent and of apparently identical condition, they are clearly of different ages: the estimate for the 'bird track' is approximately E1440 +180 / -280 years BP (Fig. 22), while the provisional ages of the two parts of the 'macropod track' are E1870 +440 / -480 years BP and E1890 +420 / -270 years BP respectively (Fig. 23). In other words, it appears that the halves of the second motif were indeed, as one would assume, made at the same time, while the 'bird track' is certainly several centuries younger.

Only one other rock art site in NE South Australia has so far yielded any quantitative data of antiquity, Sacred Canyon in the Flinders Ranges (see front cover). The site offers an inscription reading '1867 W W', which is thought to be by William Wright, who is known to have been in the area several years after the ill-fated Burke and Wills expedition. (Having been made third-in-command of the expedition on 30 October 1860, Wright is often blamed for its disastrous failure.) The inscription is certainly authentic, in the sense that its microerosion points to an age exceeding 100 years, secured from a single shattered quartz grain in the numeral '1' of '1867'. Only three micro-wane widths were extracted, averaging *A* = 0.47 microns, which on the basis of the Spear Hill calibration would correspond to an age of 109 years (Fig. 24). These values, however, are regarded as being too imprecise to allow a meaningful recalibration, particularly as the scope of the Spear Hill curve itself is of such a short range.

Sacred Canyon comprises vertically bedded, dense sandstone facies of various states of metamorphosis, ranging to quartzitic forms, with grain sizes generally in the 100–200 micron fraction, but local schlieren of

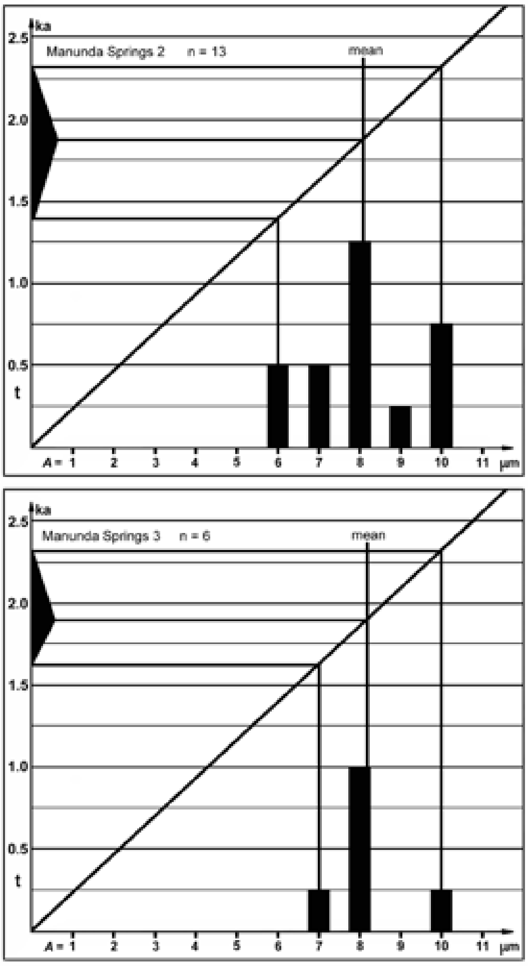

Figure 23. *Manunda Springs, microerosion analyses of the two parts of 'macropod track', with Spear Hill calibration curve.*

coarse sand fraction do occur. Another form at the site's two main panels has individual particles of about 400 µm set in a well-sorted matrix uniformly in the

Figure 24. *Part of the 1867 inscription in Sacred Canyon, by W. W., a few metres from the main panel. The marker at the numeral '1' indicates the location of the fractured quartz grain subjected to microerosion analysis.*

Figure 26. *Portion of the upper circle of the Holocene section, north-facing main panel of Sacred Canyon, with marker indicting the location of the quartz grain analysed.*

Figure 25. *Comparison of the (lower) Pleistocene panel with the (upper) Holocene panel at Sacred Canyon. One of the circles in the upper panel is estimated to be about 6400 years old (see colour scale). There is very limited similarity between the two panels, in both style and behavioural production pattern.*

60–120 μm range. Two very flat vertical panels, side by side but facing different directions (north and east respectively), are densely decorated with petroglyphs to a height of 6–7 m above the present floor. Nearly all parts of these cliffs are unscalable, formed by smooth bedding planes of quartzite grade, with some inherited weathering that may have facilitated the production of the petroglyphs on this very hard rock. Of particular importance is the north-facing main panel, immediately adjacent to the narrowest passage of the canyon, because the middle part of a profusely engraved surface has been partly lost to mass exfoliation, and the newly formed, inset panel, about 5 m wide, is just as densely engraved (see front cover). Therefore the two surfaces are of greatly different exposure ages, as are the petroglyphs covering them. This is starkly evident in their condition of preservation: those on the lower and upper third of the cliff are mostly very faded and quite hard to distinguish unless lit by strafing light, while those in the much younger, middle third are very well preserved (Fig. 25). Even a superficial examination of the panel demands a Pleistocene antiquity for the early phase, but there is empirical evidence to support that contention. Microscopic examination of the petroglyphs so high above the ground has been rather difficult in this remote site, but preliminary data from one of the motifs on the younger panel, the uppermost circle, indicated by the IFRAO Scale in Figure 25, has yielded micro-wane widths of 25–30 μm, which, based on the Spear Hill calibration, would imply an age of around 6400 years (Fig. 26). This younger phase, found on several other panels elsewhere in the canyon, covers a considerable time span and can be subdivided further. For instance a distinctive motif type, of inverted U-shapes, appears to be one of the most recent additions, but there seems to be also recent retouch of some older motifs, especially smallish circles (also clearly visible in Fig. 25). Based on the macroscopic relative Degree of Erasure (as defined in Bednarik 2009b for low-grade metamorphics), the numerous older petroglyphs (most of which are concealed by black accretionary deposits), located on the significantly older support panels, are certainly of the Pleistocene. It must be noted, however, that in making this comparison, the highest motifs are the most reliable, because the lower petroglyphs have very probably experienced fluvial wear, even though they are on the leeside of the distinctive barrier across the canyon.

It remains uncertain, however, how the producers of the Pleistocene rock art reached the high locations of most of the older motifs at this site before the detachment of part of the cliff face. Of the two most realistic explanations, the use of scaffolds or fluctuating floor levels, the latter is perhaps the more likely, particularly in view of the great density of engraving work on this very hard rock, which may indicate a long duration of activity. Indeed, Sacred Canyon is a much better candidate for now inaccessible petroglyphs than the two sites Basedow mentions, which might suggest that he was not aware of this site. Behaviourally, this Pleistocene phase resembles very closely the monumental activity traces sometimes observed in the Karake tradition, reported from deep cave sites in the Mount Gambier district (Bednarik 1990), whose early phase is also dominated by deeply hammered patterns of curvilinear configurations and mazes, individual and variant circles, and multiple arcs, but entirely free of 'tracks'. However, the absence

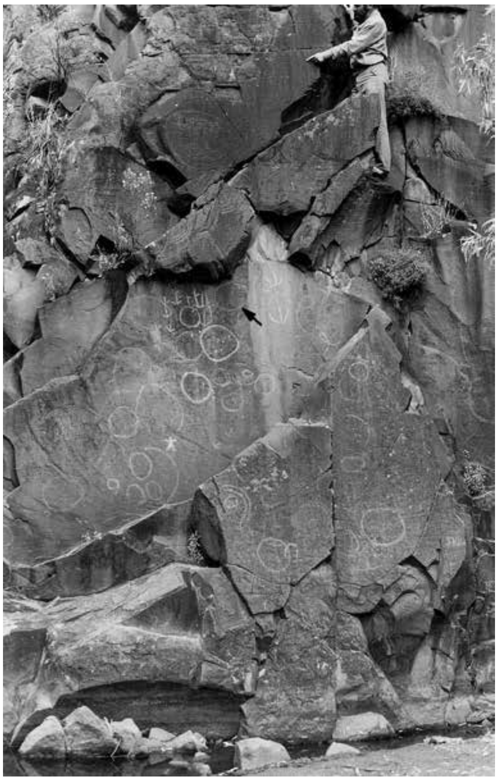

Figure 27. *The author, an expert rock climber, pointing to some of the high petroglyphs of Sacred Canyon in 1984. The arrow indicates the circle motif estimated to be 6400 years old. Photograph by Elfriede Bednarik.*

Figure 28. *One of many complex designs at Panaramitee North defying the definition of a 'Panaramitee style'.*

of distinctive cupule panels at Sacred Canyon (and most other sites of the region) could be seen as excluding an antiquity exceeding 20 or 25 ka. Therefore the best present age estimate for the early palaeoart phase at this remarkable site is 10–20 ka. It seems feasible to secure reliable microerosion dates from Sacred Canyon, but this would involve access for microscopy of the upper petroglyphs (Fig. 27). Although much of the Pleistocene palaeoart at Sacred Canyon is too faint to trace confidently, the recognisable motifs consist essentially of circles, curvilinear mazes and sets of multiple arcs.

Discussion

The petroglyphs of secure Pleistocene attribution, such as those found in limestone caves or on granitic or quartzite facies at open sites, are certainly very different from what has been called the Panaramitee style. The only obvious component they share with that 'style' are circles, but even here a tendency in the older phase towards 'variant circles' or 'curviform mazes' is apparent. One of the most surprising aspects of the Panaramitee concept is how little it can be reconciled with the actual 'type-site' of this purported style (see also Fig. 8; note that there are numerous other sites on the Panaramitee property, see Mott 1998). Although there are the usual circles and 'tracks' at Panaramitee North, the more outstanding motifs are the complex linear designs, sometimes incorporating ornate spirals (Fig. 28), which are largely absent at other sites defined as 'Panaramitee' by some archaeologists. Also, the complex figurative elements at Panaramitee North need to be considered, such as the *yarida* motif and a very detailed figure of a 'fish', which members of the 2009 AURA fieldtrip examined closely and felt it might depict a catfish (Fig. 29) rather than Mountford and Edwards' (1962) marine fish. Some of these visitors commented that, of all the sites they had seen in the region, Panaramitee North was among the least typical to represent the construct of the Panaramitee style. Indeed, it is hardly a coincidence that the most fervent advocates of the 'Panaramitee style' have

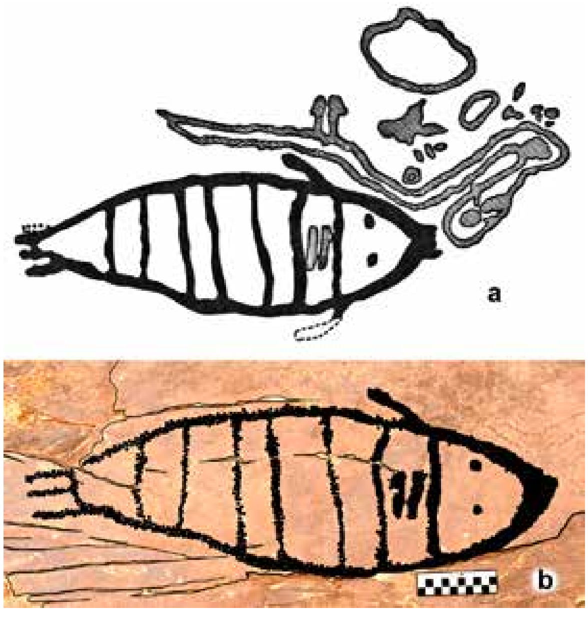

Figure 29. *A pisciform petroglyph at Panaramitee North, apparently early and fairly naturalistic; recordings by (a) Mountford and Edwards (1962) and (b) showing individual peck marks and exfoliated areas.*

Figure 30. *Superimposition of two petroglyph traditions of greatly differing ages (compare difference in accretionary deposits) at Panaramitee North, the purported type-site of the 'Panaramitee style'.*

never actually been to the site, and its contents have not been described adequately. In short, the concept of this style is perhaps attributable to a series of misunderstandings (such as those listed above), to inadequate information, to unrealistic expectations about its age — but most importantly to the lumping together of traditions of greatly different ages simply because they occur at the same sites. The idea of the presence of megafaunal tracks, which now appears to be bereft of credible support, reinforced the vague notion of very great age, as did the claims of the depiction of extinct species. Since there is not a shred of credible Australian evidence that figurative rock art has survived from the Pleistocene, claims based on iconography would always need to be verified independently.

Another reason for attributing a Pleistocene age to the 'Panaramitee style' was Maynard's conviction that Tasmanian petroglyphs are of the same style, which must therefore have arrived on the island prior to its sunderance towards the end of the Pleistocene. Once again, the proposition is easily refuted. Not only does the Tasmanian corpus exclude 'track' motifs, supposedly the principal component of her 'style', cupules, which form the largest Tasmanian component, are almost absent from 'Panaramitee' sites. Tasmanian petroglyph sites are either coastal (Sims 1977) or occur at high elevations (Bednarik et al. 2007; Sims 2008), whereas those of the 'Panaramitee' are usually found at inland waterholes or streambeds, and typically not on the coast or on mountains. But the Tasmanian tradition closely resembles Pleistocene site inventories on the mainland, such as Sacred Canyon's early phase (e.g. arcs at Sundown Point) or the Karake tradition of the Mt Gambier caves (virtually matching sites such as Preminghana). As in Tasmania and in the caves, 'tracks' are also lacking in the sites of the Early Man complex (Rosenfeld 1981, 1991), which presents many similarities with the late Karake genre.

The two fundamental errors that were made in the establishment, identification, defence and vindication of the 'Panaramitee style' are the following:

1. The most elementary methodological tool of the archaeologist is the separation of chronological entities, e.g. tool traditions, through the stratigraphy provided by excavation. No archaeological purpose of any kind would be served if the excavator of a site lumped together into one single lot all the stone implements of an entire deposit spanning the Palaeolithic, Mesolithic and Neolithic and pronounced them as being of the 'Stone Age'. Yet in the case of the Panaramitee, this most 'un-archaeological' approach is precisely what has been applied. Unless archaeologists subject rock art to the same chronological separation as archaeological remains, all their statistics, motif types and pronouncements will be and must be falsities (Fig. 30).
2. To appreciate the relative longevity of petroglyphs on different lithologies, the following ground rule needs to be understood. *The time it takes natural processes of erosion and weathering to efface a petroglyph is proportionally similar to the time it takes to create it, relative to rock hardness and density*. Thus if it takes a thousand times as long to create a 12-mm-deep cupule on fully metamorphosed quartzite (Kumar 2007) than it takes to make an identical cupule on weathered sandstone (Bednarik 1998c) — as is indeed roughly the case — it will take in the order of a thousand times as long to expunge it on the quartzite, relative to the sandstone.

Concerning the second point: to create a 'standard cupule' (Bednarik 1998c) on very hard quartzite with a hammerstone requires in excess of 30 000 strokes, or several days of pounding — as shown by the diligent research of Giriraj Kumar. To produce the same feature on weathered, siliceous sandstone takes two minutes. It requires less than one minute on soft limestone (Bednarik and Montelle, in prep.). This provides an indication of the profound effect of rock hardness and density on petroglyph production times, but it also provides a measure of the equally profound differences in petroglyph longevity (Bednarik 2008b: 85–90). Unfamiliarity or neglect of this simple principle has led to numerous consequential misjudgements of petroglyph age, in practically every continent, at thousands of sites. For instance petroglyphs on slates, schists, phyllites and limestones, fully exposed to the weather, have been attributed to the Pleistocene by archaeologists worldwide — not just in the Australian case of the 'Panaramitee'. What is particularly disturbing about these misapprehensions is that at some of these sites, e.g. in Spain and Portugal, dated historical inscriptions co-occur with the petroglyphs, and as they are subjected to the same regime of weathering they provide a good measure of rock marking ages. Such deterioration can even extend to fluvial erosion, which has now been quantified against time through such inscriptions, and even when it is thus demonstrated that petroglyphs of the same site are of the 20th century

(Bednarik 2009b), some archaeologists continue to insist that they must be Palaeolithic.

One more observation concerning the taphonomy of the Broken Hill – Flinders Ranges petroglyph sites, considered collectively, is that they tend to occur at sites where a stream broke through a rock barrier. Such barriers range from the perhaps most pronounced examples at Euriowie and Sacred Canyon, with substantial barriers of vertical strata of relatively hard rock, to low rock ridges, often covered by sediment now, barring the flow of rivers. Such sites tend to retain water longest, but their rocks may be somewhat harder than the region's general lithology. It may then be that such sites have facilitated selective preservation of petroglyphs (Bednarik 1994b).

In the case of the professed Pleistocene antiquity of the 'Panaramitee style', Smith et al. (2009) have recently investigated such petroglyphs at two central Australian sites, Wanga East and Puritjarra, and demonstrated that they are of mid-Holocene ages. Providing two internally consistent series of ^{14}C dates, from both sedimentary charcoal and calcium oxalate skins (on and off petroglyphs), they managed to bracket petroglyph ages convincingly. Their findings are in agreement with those of the present paper, that petroglyph corpora assigned to the 'Panaramitee' tend to be significantly younger than postulated by the advocates of this 'style'. This follows several previous expressions of doubts, of either the homogeneity or the claimed age of the 'Panaramitee', e.g. by Bednarik (1985, 1988, 1995, 1997a), Rosenfeld (1991), Layton (1992), David et al. (1992) and others. Similarly, the evidence by Smith et al. might confirm the inconclusive but probable mid-Holocene age of the numerous circle petroglyphs in Mt Yengo Rockshelter (McDonald 1991), a panel which resembles many of the sites in NE South Australia (e.g. Moolooloo, Yanyarrie Creek, Orroroo, Stone Chimney Creek). More trenchantly, 'Panaramitee style' petroglyphs, resembling those at hundreds of sites pronounced to be of that style, were still produced in central Australia in the 20th century (Fig. 31). This issue could have long been clarified, had it not been for the intransigence of the Panaramitee proponents (e.g. Franklin 1991, where opposition to the concept is defined as appearing 'to be an attempt to inhibit research' into this fictional style).

The series of oxalate-derived AMS dates recently presented by Cole and Watchman (2005) includes conservative minimum ages of 8500 ± 60 and 9160 ± 70 years BP from archaic petroglyphs on protected sandstone surfaces in northern Queensland. Their date of 1275 ± 95 from oxalate at the base of the crust formed in a petroglyph groove at the Early Man Shelter does not necessarily contradict Rosenfeld's archaeological dating of part of the panel to the Late Pleistocene. The site's substrate is less stable and protected, and as the authors note, the rate of oxalate crust formation may not have kept up with the rate of exfoliation. Concerning accessibility of the upper part of the panel, several sites have now presented evidence that Pleistocene palaeoartists in Australia went to considerable lengths to create petroglyphs in highly inaccessible places (e.g. Sacred Canyon, Sandy Creek Shelter 1, and several of the limestone cave sites).

Figure 31. *Production of 'Panaramitee-style' petroglyphs in the 20th century, central Australia. Photograph by Charles P. Mountford in 1937 at Thompson's rock-hole, near The Granites, Northern Territory.*

None of this answers any of the obvious questions, such as how does one detect Pleistocene rock art in Australia, how can realistic candidates for such age be identified, or how much of such rock art should be assumed to have survived in this country. The first concerns are relatively easy to satisfy, once the Panaramitee mythology is relinquished. Several corpora or distinctive types of rock art have high prospects of being of the Pleistocene.

Cupules

These are among the earliest rock art known in the world, and they are so in all continents with rock art (Bednarik 2008b). This does not necessarily mean that they are the oldest rock art ever produced; cupules are often the deepest petroglyphs, so they tend to be of the greatest longevity, and taphonomic logic demands that they are then unlikely to be the oldest made. Moreover, cupules were also created by numerous recent rock art traditions, right up to the Middle Ages of Europe or the 20th century in Australia; therefore the presence of cupules as such is not necessarily an indication of age. In Australia, some cupules are certainly up to 30 ka old and even beyond, especially those occurring on granitic rocks, e.g. in the eastern Pilbara (Bednarik 2002a), in northern Queensland (e.g. at Turtle Rock, Bednarik 1993; also at Sandy Creek on sandstone) and no doubt elsewhere. The occurrence of Lower Palaeolithic cupule panels in southern Asia (Bednarik et al. 2005) renders it likely that this practice was introduced in Australia with first landfall by humans, perhaps 50 or 60 ka ago.

Cave petroglyphs

Much of the cave art of Australia, like that of SW Europe, is of the Pleistocene. This can be demonstrated at some sites, such as Malangine, Koongine, Yaranda and Koonalda Caves, and is probably the case at numerous others, including Karake, Paroong, Karlie-ngoinpool, Orchestra Shell and New Guinea 2 Caves (Bednarik 1986, 1990, 1998b, 1999, 2006). The traditions in question include finger fluting, found in thirty-three Australian sites so far, with the proviso that this tradition was certainly continued well into the Holocene at specific sites (such as Prung-kart Cave). Secondly, tool grooves have been identified in several caves that are very likely of the Ice Age. Thirdly, a 'cave version' of the archaic linear petroglyph tradition has been defined as Karake genre, after Karake Cave, which matches not only the linear petroglyphs of Tasmania, but also those at thousands of mainland sites, across the continent (Fig. 32).

Figure 32. *Cave petroglyphs of the Karake genre, which generally resembles Pleistocene linear petroglyphs at open sites. Karlie-ngoinpool Cave, near Mt Gambier, in 1985.*

Archaic linear petroglyphs

First defined in Bednarik (1988: Fig. 1, also 1997a; Flood 1997: 214), this genre, tradition or group of traditions of rock art seems to occur widely across Australia and is dominated by curvilinear mazes (the main motif at Sandy Creek Shelter 1 in Cape York Peninsula comes to mind; Fig. 33) and circles, including (in the later phase perhaps) circles with internal barring and divided circles. Another apparently late addition to the repertoire of this 'tradition' is the CLM (convergent lines motif), which most often occurs as tripartite forms (hence called 'trident' by Rosenfeld) and in a variety of variants. Less common are arcs, wave lines or zigzags. Most importantly, the tradition is entirely free of both human and other animal track-like forms as well as any other figurative imagery, and often conveys the impression that the concept of individual motifs is of limited relevance to its manifestations. Its larger compositions could be seen as combinations of many motifs, or repetitive variations on graphic universals. As noted above, Archaic linear petroglyphs were often created in the most inaccessible locations. Because they have long been subsumed under the heading of the 'Panaramitee style', their distinctive character remains largely unexplored, which is perhaps the single most effective reason for the neglect of Pleistocene rock art in Australia. Apart from limited chronological information from caves, time depth has been provided for this tradition only in the Pilbara, where a few randomly chosen circular and curvilinear motifs have provided dates of up to about 27 ka (Bednarik 2001b, 2002a, 2002b).

Figure 33. *Typical curvilinear maze design of the archaic linear tradition, surviving in a well-protected location under a thick silica skin; Sandy Creek, Cape York Peninsula. The traces of chalking predate 1982 (see Flood 1987: Pl. 8).*

Pictograms

Watchman's pioneering work of detecting paint residues in sequences of oxalate accretions has soundly established the presence of early ochre applications in

Australian rockshelters (Watchman 1990, 1992b, 1993, 2000; Watchman and Hatte 1996). Nevertheless, the nature of this Pleistocene tradition of pictograms remains largely unknown, because its survival on substrate surfaces may have only been possible in speleoclimatic conditions. Object imprints, e.g. of grass bundles, often found in northern Australia, have been suggested to be very early, but there is no confirmation that they might extend into Pleistocene times. At present, the perhaps most promising pictogram candidates for such age are hand stencils in deep limestone caves, such as those in Tasmania, Western Australia and South Australia (Bednarik 1990). Nevertheless, even here such antiquity remains to be demonstrated satisfactorily. Certainly there is ample evidence that haematite has been used in Australia since soon after first human colonisation (Jones 1985; Roberts et al. 1990; Thorne et al. 1999), and previously in three other continents since the Lower Palaeolithic (Bednarik 1994a).

Figure 34. *Tasmanian petroglyphs at Trial Harbour, west coast.*

The Tasmanian issue

So far, Tasmania has not provided any indication of Pleistocene age for rock art, apart from limited or circumstantial evidence from cave pictograms (Cosgrove and Jones 1989; Loy et al. 1990; Brown 1991). One of Maynard's contentions concerning the proposed antiquity of her 'Panaramitee style' is its purported similarity with Tasmanian petroglyphs. Although that similarity is not evident (see above), her logic is valid: if there was rock art in Sahul, it may be reflected in that of Tasmania after the island's sunderance. Indeed, this does seem to be the case: if one eliminates the Panaramitee concept from early mainland petroglyph conventions, one is left with a corpus closely resembling that of Tasmania: numerous cupule panels, circle motifs of various types (Fig. 34), some arcs and CLMs, and a notable absence of the main component of the 'Panaramitee', the 'tracks'. Therefore, in that sense, Maynard's reasoning was correct, but her evidence was not.

Other aspects of early traditions

As observed by both Bednarik (1986) and Rosenfeld (1991), a distinguishing factor of Australian Pleistocene rock art is the integration of natural aspects of the support panel (shape, texture, micro-topography) into the arrangement of motifs. This is sometimes referred to as 'isomorphic congruence', an aspect also widely observed in the Lower and Middle Palaeolithic palaeoart of other continents, in the sense that it is sometimes perceived as illustrating cognitive reactions to pre-existing conditions of a support surface (Bednarik 1986 et passim). Early Australian rock art preserved this ancient feature, which in the Old World can be traced back to the Lower Palaeolithic, in its marking strategies. It is much less pronounced in Australian Holocene traditions. Often it takes on the appearance of 'overcrowding' of specific panels, or parts of panels, with intricate and repetitive line-work, while equally suitable adjacent surfaces were ignored. Another distinctive feature of Pleistocene rock art is the apparent significance of impact with the medium, best evidenced in the cave art. Specific and spatially discrete rock panels were subjected to extensive battering, and it seems to be the act of mark production rather than its result that was of significance to the actors.

Quantifying Australian Pleistocene rock art

In the absence of large-scale dating programs it may be premature to assess the frequency of Pleistocene rock art in Australia. Nevertheless, it is pertinent that there is no plausible evidence, anywhere in the world, of rock paintings or other pictograms having survived from the Pleistocene, except in 'fluke conditions': under mineral accretions (oxalate, silica or carbonate) or in deep limestone caves. Petroglyphs, on the other hand, can be much more resistant to weathering processes, and on specific rock types and under favourable environmental conditions can at open sites survive for periods of tens of millennia. Taphonomic logic decrees that this applies especially on very hard and dense rocks and in arid or semi-arid regions, and that deeply cut petroglyphs survive longest (Bednarik 1994b). The earliest period seems to be dominated by cupules and linear grooves, followed by circles and circular motifs, CLMs and other specific 'geometric' patterns.

This trend is not limited to Australia; it may well be universal. The earliest petroglyphs of Asia, Africa and Europe are also dominated by cupules, and those of the Americas by cupules and linear grooves (Bednarik 2008b). Indeed, the pattern is so uniform that these genres of petroglyphs seem to define a Mode 3 (Foley and Lahr 1997), or 'Middle Palaeolithic/Middle Stone Age' tradition. Australia is presumed to have been initially settled by Middle Palaeolithic seafarers from southern Asia, who in view of the much earlier

Figure 35. *Circles with internal barring in Paroong Cave, near Mt Gambier, in 1983, shortly after their re-discovery by G. Aslin.*

presence of this rock art tradition in India have been suggested to have imported it with their initial arrival (Bednarik 1997b; Bednarik and Kuckenburg 1999). The Middle Palaeolithic stone tool technology they also introduced continued in Australia to the mid-Holocene as the 'core and scraper tradition', and in Tasmania up to the British destruction of traditional society just 200 years ago. Therefore all of Pleistocene rock art in Australia is necessarily of Mode 3 ('Middle Palaeolithic') provenance, as is all rock art in Tasmania. The latter might then provide an initial or preliminary template of what one could expect to find in Middle Palaeolithic rock art traditions. Tasmanian rock art is dominated by cupules (although they have been archaeologically neglected on that island, as well as on the Australian mainland) (Sims 1977, 2008; Bednarik et al. 2007), featuring also circular motifs, including the divided circles and circles with internal barring that are so prominent in the 'Karake genre' of the caves of Mt Gambier (Fig. 35) on the mainland. It appears certain that CLMs, which occur with two to five lines, joined or unjoined (and when comprising three 'toes' are often labelled bird tracks without proof), are discrete features not intended to depict tracks.

It is possible to speculate about the extent of Pleistocene rock art in Australia by resorting to the following reasonable assumptions. Deeply hammered, deeply weathered and deeply patinated noniconic petroglyphs on particularly erosion-resistant rock types are probably of the Pleistocene, as are perhaps most of those found in limestone caves. At open sites these petroglyphs occur usually in arid or semi-arid regions, typically on hard rock types such as granites and other igneous facies that suffer little weathering, or on well-metamorphosed quartzites. At a rough estimate the proportion of motifs that should be expected to fall into this category is perhaps in the order of 10% of the total Australian inventory. Since it is reasonably estimated that there are at least ten million petroglyphs in Australia, it follows that over a million petroglyphs could be expected to have survived from the Pleistocene (Bednarik 1995b, 1997a). This may well be higher than the combined number of surviving Mode 3 petroglyphs from the rest of the world (few are known currently, a most notable concentration being that of the southern Kalahari, dating from MSA and possibly Fauresmith times; Fig. 36; Beaumont and Bednarik in prep.), and it is certainly significantly higher than the total number of motifs so far reported from presumed Upper Palaeolithic or Mode 4 traditions in the rest of the world (well below 50 000). The latter are almost exclusively a western European phenomenon according to present knowledge — although that proposition also needs to be tested.

Figure 36. *Mode 3 circle and cupules on quartzite at Klipbak Site 1, southern Kalahari.*

Two fundamental observations follow on from these considerations. Firstly, it has long been assumed that there is almost no Middle Palaeolithic rock art, La Ferrassie being a rare exception; in fact there is far more surviving Middle Palaeolithic (or Mode 3) than Upper Palaeolithic rock art in the world. Secondly, whereas there are great variations among the latter traditions, the earlier ones seem to be defined by considerable uniformities across continents. However, it needs to be appreciated that this could well be a sampling phenomenon, attributable to the taphonomy of rock art (Bednarik 1994b). All surviving Mode 3 rock art can be regarded as being of the greatest taphonomic longevity. It should therefore logically be seen as a taphonomically determined remnant population, from which the less deterioration-resistant forms have all been culled. In other words, the apparent uniformity of the Mode 3 petroglyphs should be regarded as being to some degree a sampling artefact, in the same sense as the perceived preference of cave locations for the production of Mode 4 rock art is almost certainly a taphonomic effect. All palaeoart samples of the Pleistocene, be they portable or not, must be regarded as remnant populations that have experienced massive taphonomic truncation, in several senses. This is also evident from the composition of the surviving sample of Upper Palaeolithic mobiliary art: it consists almost entirely of materials that survive preferentially in high-pH sediments and is always found in such sediments. It includes objects consisting largely or entirely of calcium carbonate, calcium phosphate or dentine, which also implies a massive taphonomic bias.

Summary

A review of secure or potential candidates of Australian Pleistocene rock art suggests not only that this corpus might be the largest of its kind in the world, it also implies that it consists entirely of a repertoire that, in the Old World, would inevitably be regarded as having been produced by societies possessing what are defined as Middle Palaeolithic/MSA technologies. The popular notion of art-like productions commencing with the famous Upper Palaeolithic traditions of the caves of SW Europe is a significant misconception that has marred practically all discussions of the origins of symboling. Rather than seeing the emergence of graphic exograms (single entries in an extra-cranial symbolic storage system; Donald 1991: 308–333, 1993, 2001: 305–315; contrast with engrams — hypothetical, but not so far demonstrated, single entries in a biological memory system, stored in response to external stimuli as a biophysical or biochemical change in neural tissue; cf. Bednarik 1987, in prep.) as a phenomenon that emerged miraculously in France with the advent of the Aurignacian, the use of exograms — which marks modernity in the human lineage — is a gradual development occurring over hundreds of millennia, and mostly outside of the Franco-Cantabrian theatre. The Palaeolithic cave art has attracted considerable attention for over a century, expressed in thousands of books and tens of thousands of articles, whereas the remaining Pleistocene palaeoart of the world has been largely ignored. The value judgments deriving from this neglect have had far-reaching consequences, not only in public appreciation but also in preservation priorities. While sites of Franco-Cantabrian cave art are subjected to the greatest care and protection, corresponding to their perceived relevance to the 'origins of human culture', contemporaneous or earlier palaeoart elsewhere is afforded a significantly lower value or level of protection, or none at all.

This is noticeable in Australia, where the largest known corpus of Pleistocene rock art occurs but has so far received very limited scholarly attention, and as a result of archaeological misconceptions has not even been credibly defined. Whereas in France and Spain, the realisation just over a century ago of the significance of the discovered body of early palaeoart has prompted its appreciation, effective study and a great concern for its preservation, the even more archaic palaeoart of Australia remains severely neglected and most inadequately protected. This is squarely attributable to the inability of Australian archaeology, for that entire same century since Basedow first proposed its age, to effectively identify, study and date Australian Pleistocene rock art. There can be no doubt that the issues of inadequate study, appreciation and protection are closely intertwined, and that poorly formulated research based on fallacies has contributed to this state of affairs. And yet, seen in purely scientific terms, Australian Pleistocene palaeoart is considerably more important than European, simply because it derives from an earlier technological context and therefore can tell us far more about the beginnings of symbol use and human cognitive evolution. Although similar material of comparably early nature does occur elsewhere in the world, it seems to have survived in far greater quantity in Australia, which on present indications harbours far more Mode 3 rock art than the rest of the world combined. Large corpora of such material may yet be found in Africa or Asia, but as it currently stands it would appear that well over 90% of the world's Mode 3 rock art has survived in Australia. Instead of celebrating and promoting this incredible treasure trove, Australian archaeologists have, it can fairly be said, either ignored it or misconstrued it. This has contributed to its neglect and ongoing destruction: no European site of Pleistocene rock art would be subjected to the neglect such Australian petroglyph sites have consistently experienced.

Acknowledgments

The author thanks the participants of the AURA fieldtrip of 2009, to the heartland of the 'Panaramitee style', for their valuable feedback. Thanks are also due to Peter Beven, John McGovern, Geoffrey Aslin, Elfriede Bednarik, Ross Sawers, Kim Riggs, Roslyn and Warren Breeding, Jean Fisher, Carmel Reynolds, and the *RAR* referees of this paper: Dr Noelene Cole, Dr Livio Dobrez, Professor June Ross and Peter C. Sims OAM.

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Final MS submitted 15 December 2009.

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RAR 27-964

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