MEGAFAUNA DEPICTIONS IN AUSTRALIAN ROCK ART

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Abstract. The numerous published claims concerning the depiction in Australian rock art of megafaunal species or their tracks are examined. Such proposals have appeared for a century now and they have involved both petroglyphs and pictograms. Patterns in the consideration of the evidence presented in their support are analysed and compared with patterns of similar contentions in other parts of the world. The rationales underpinning these various claims are examined and an attempt is presented to explain their apparent causes.

Introduction

In comparing the history of the study of Pleistocene rock art in Australia with that of Europe certain similarities are evident. In Europe, the notion of Palaeolithic cave art was vehemently rejected by all archaeologists, just as the notion of a Palaeolithic itself (Boucher de Perthes 1846) and the proposal of fossil man (Fuhlrott 1859) had been indignantly scorned a few decades previously. The authenticity of the first palaeoart site proposed to be of the Ice Age, Altamira (de Sautuola 1880), was only accepted by the gatekeepers of the human past 23 years after it had been recognised, and only in the face of overwhelming evidence (Cartailhac 1902). In the following year, 1903, the young geologist Herbert Basedow participated in the South Australian Government North-West Prospecting Expedition, when he first became acquainted with the petroglyphs of South Australia. Although he began publishing on this in the following year (Basedow 1904, 1907), his findings were not comprehensively available for another ten years (Basedow 1914). His principal proposal was that, primarily on geological grounds, some of this rock art should be of the Pleistocene. At that time archaeology assumed that humans had been present in Australia for only a few millennia (e.g. Gregory 1904), and Basedow’s proposal was rejected for half a century, just as the pronouncements of non-archaeologists had been in Europe. Yet it means that, as soon as the antiquity of the European cave art was accepted, Australia became the second continent where such an age for rock art was mooted, even if unsuccessfully. In Asia, such claims for rock paintings appeared first in the 1970s, but have not been substantiated so far and it was petroglyphs that were first soundly attributed to the Pleistocene (Bednarik et al. 2005); in Africa, credible claims for Pleistocene rock art only date from recent years (Beaumont and Bednarik 2010, 2013; Bednarik and Beaumont 2010; Huyge et al. 2011); and in the Americas, this issue remains to be resolved. In short, the discovery of Ice Age rock art has a history marred by rejections and false claims; for instance many of the Pleistocene attributions of European rock art are falsities (Bednarik 1995a, 2002, 2009). At least in that sense the situations in Europe and Australia match closely, in that archaeology seeks to dictate what are acceptable findings, but usually turns out to be wrong, and the sciences have to contend with its dogmas.

Basedow was not only the first to correctly recognise the antiquity of the Aborigines, he was also the first to suggest that the tracks of extinct species might have been depicted in Australian rock art. He first proposed in 1907 that some of the bird track-like petroglyphs he saw at the South Australian site Balparana could be of *Genyornis* (Basedow 1914: 201). He also noted the occurrence of what he thought depicts a platypus (*Ornithorhynchus anatinus*), a monotreme now absent in the region, reasoning that it must refer to a much earlier time. However, he presents these possibilities as supporting evidence, relying primarily on various geological observations: the patination concealing most petroglyphs at the sites he considers is his ‘strongest evidence’. He also cites the observation of petroglyphs on cliff faces that became inaccessible after the rock shelves on which the rock artist stood had collapsed, at Wilkindinna and Deception Creek (also the case at Yunta Springs; Bednarik 2010), and the occurrence of
The main claims made

The earliest specific claim is Mountford’s (1929) proposition that the most complex petroglyph motif at the Panaramitee North site near Yunta is a naturalistic depiction of a saltwater crocodile’s (*Crocodylus porosus*) head. In comparing his recording of the petroglyph with a sketch of the crocodile’s skull Mountford notes that the outline, placing of eyes, nostrils and sutures bear a number of resemblances (Figs 1 and 2). It is not clear, however, why the artist would have depicted a skull rather than a live specimen, unless s/he sought to illustrate a fossil. That might be the case, but it would imply that the image is much more recent than the time the animal lived. Another possibility is that the image is in x-ray style, but this would infer a recent age and x-ray style focuses on internal organs rather than skull sutures. Mountford even mentions the discovery of crocodilian remains, but at sites some 1400 km to the north. Mountford and Edwards later state that

> [t]he fact that the nearest sea-going crocodile is, at the present day, at least a thousand miles north of the rock engraving, suggests that the engraving must be of considerable antiquity. It is extremely unlikely that any aboriginal could have engraved a design having so many points of resemblance with a living creature if he had not known it intimately (Mountford and Edwards 1962: 98).

Mountford and Edwards also attributed two more petroglyphs to the Pleistocene. One, at Yunta Springs (Mountford 1928: Fig. 87), is described as a turtle, ‘which on closer examination, proved to be a representation of a marine turtle’ (Mountford and Edwards 1962: 98, 1963). It was ‘identified’ as such by John Mitchell, then the Curator of Reptiles of the South Australian Museum (Fig. 3). The other, a pisciform figure at Panaramitee North (Bednarik 2010: Fig. 29), was ‘identified’ by Trevor Scott, then the Curator of Fishes at the same museum, ‘as a representation of one of the species of
marine fish that live on the sea bottom’ (Mountford and Edwards 1962: 99). They then conclude that ‘[t]hese facts suggest that, at some time (not yet established), the sea must have been closer to the localities at which the engravings were found, than at present’. They are more specific two years later, stating that the present sea coast is over 100 miles away from these petroglyphs (Mountford and Edwards 1964: 850). They present two more significant claims for great antiquity of the petroglyph tradition they describe: the absence of dingo tracks, which they say occur in rock paintings but not in the petroglyphs (Mountford and Edwards 1962: 98; also Edwards 1965: 227); and the observation that Aborigines consistently deny that petroglyphs were made by humans, but insist that they are the work of mythical creation heroes (e.g. Mountford 1960: 145).

In responding to a report by Hall et al. (1951), Tindale (who also visited Yunta Springs) proposed that a series of nine petroglyphs in the bed of the Eucolo Creek, west of Woomera, resembling very large bird tracks, are depictions of *Genyornis* tracks (Tindale 1951). Interestingly these are in the order of 45 cm long (Fig. 4), which is also the length of one presumed bird track at the Red Gorge site, Deception Creek complex (Bednarik 2010: 105). A similar possibility had been mentioned by Basedow (1907) concerning large emu-like tracks at Balparana Creek, about 50 km north-east of Leigh Creek, which seemed to be reinforced by the Eucolo petroglyphs. Soon after his collaboration with Mountford, Edwards examined the large petroglyph site at Tiverton, south of the Panamaritee sites (Edwards 1965). He noted the occurrence of images apparently depicting large macropod tracks, in one case of a pair measuring 46 cm, and attributed these to *Procoptodon*, although also allowing for the possibility that they represent the tracks of a mythological creature (op. cit.: 229). Similarly, McDonald (1983: 242) concluded from her examination of the large petroglyph site Sturts Meadows, north of Broken Hill, that an apparent macropod track with a single toe possibly depicted the track of *Procoptodon goliah*. However, in her subsequent analysis of the site’s macropod track motifs (McDonald 1993) she makes no mention of this notion and does not cite the 1983 paper, having apparently abandoned her megafaunal claim.

The remaining prominent assertions of this nature refer not to tracks, as in all previous cases, but to the depiction of megafauna animals. The first of them is by Murray and Chaloupka (1984), who consider the possible presence of images of *Palorchestes*, *Zaglossus*, *Thylacoleo*, *Protemnodon* and *Sthenurus* in the rock paintings of Arnhem Land, northern Australia. They find no convincing support for the identification of the last-named genus, primarily because any blunt-headed, heavy-set macropod images are shown with three-toed hind feet, while those with monodactyl hind feet display typical kangaroo form (op. cit.: 111). Similarly, they discount the possibility that another large kangaroo, *Protemnodon*, was depicted in Arnhem Land rock art. Murray and Chaloupka are circumspect in their assessment of the remaining taxa, they ‘confess that [their] results for now remain outside the reach of scientific confirmation’ (p. 107). They present two possible *Thylacoleo* paintings, rehearsing various arguments but then concede that these images are ‘suggestive, but inconclusive’ (p. 112). They discuss the image of an unusual quadruped in some detail, considering the possibility that it depicts *Palorchestes*, concluding that ‘it must be made very clear that the connection at present is of the most tenuous kind’ (p. 114). Their discussion of *Zaglossus* is somewhat more confident, yet in the end they admit that the representation of this genus would not necessarily imply a Pleistocene age (p. 108). The authors also suggest that three depictions of the dingo (*Canis familiaris*) in a style they confidently place in the Pleistocene ‘strongly imply that the genus *Canis* was present during the pre-estuarine period’ (p. 109), which Chaloupka (1993: 89) places at around 20 000 years ago and ending 8000 years ago.

*Palorchestes* is a genus of the order Diprotodontia, and a subsequent proposition that a *Diprotodon* has been depicted in a rock painting came from Cape York Peninsula (Trezise 1993). This claim was presented...
at the First AURA Congress in Darwin, in 1988, and immediately raised considerable scepticism, primarily because Trezise’s recording (Fig. 5) showed many anatomical features that are incompatible with *Diprotodon*. Murray and Chaloupka’s careful consideration of the possibility that two quadruped paintings in Arnhem Land were depictions of *Thylacoleo* was then followed by three less judicious claims concerning Kimberley painted zoomorphs (Akerman 1998, 2009; Akerman and Willing 2009). Of the most recent assertions of this kind, the most prominent has been Gunn et al.’s (2011) proposition that a pictogram in Arnhem Land appears to be of *Genyornis*.

Before reviewing these many postulated identifications of zoomorphs and apparent animal tracks as relating to Pleistocene species it needs to be emphasised that none of them are supported by direct or scientific dating, and that their basis are the perceived iconographic properties of the rock art. These claims are without exception circumstantial, and their number is no substitute for a single testable proposition. Their only scientific support comes from the analytical data provided by Dorn (Nobbs and Dorn 1988; Dorn et al. 1988; 1992), who subsequently withdrew all his rock art dating claims (Dorn 1996a, 1996b) after they were refuted (Watchman 1992a, 1992b, 1992c). This illustrates the difference between scientific and non-scientific propositions: the former are testable. The claim that the cited rock art is indicative of megafauna is not testable; the claim that it is of the Pleistocene is refutable, but has not yet been tested.

**Review of these claims**

Crocodilian fossil remains of the Tertiary and Pleistocene have been reported in Australia since the mid-19th century, but the first report of *Crocodilus porosus* is relatively recent (Archer and Wade 1976). This snout of a small specimen from Bluff Downs, north Queensland, was identified by Molnar (1979). The nearest finds of crocodilians were made 500 km north of the Panamitee Station, but they are attributed to *Pallimnarchus* sp. Merigian et al. (1993) reported a *Crocodileus*-like specimen from the Kutijara Formation of the Lake Eyre basin, although this is based on very fragmentary material with few diagnostic features and thus not identifiable at the species level. The Kutijara Formation is between 350 ka and 260 ka old (Morton et al. 1995: 8), i.e. significantly earlier than the accepted presence of hominins in Australia. The nearest identified remains of *Crocodileus* are those from the Gregory and Leichardt Rivers, Gulf of Carpentaria, 1400 km distant from Panamitee. In fact no crocodile fossils of any species are known south of latitude 30°, and all of those reported south of 18° are either of *Quinkana* or *Pallimnarchus* (Willis 1997: Fig. 6). Therefore the geographical range of fossil *Crocodileus* seems consistent with its recent distribution, and the claims of Mountford and Edwards derive no support from palaeontology. As Webb and Manolis (1989) note, *Crocodileus* is unlikely to have penetrated even as far south as the Lake Eye basin.

However, it could be countered that perhaps another crocodilian taxon was depicted at Panamitee. From the Pliocene and Pleistocene, a few potential candidates come to mind. *Crocodileus johnstoni* is of a morphology differing significantly from the petroglyph, and the only two fossil specimens reported of this extant freshwater species are from Riversleigh, north-western Queensland (Willis and Archer 1990). The large freshwater crocodile *Pallimnarchus pollens* (De Vis 1886; Willis and Molnar 1997; Molnar 1982) has been found at numerous sites in north-eastern Australia (including 17 sites in the southern Lake Eyre basin; Webb 2009), and at Windjana Gorge, Kimberley. However, it differs from the shape and ‘suture’ patterns of the Panamitee petroglyph. *Crocodileus nathani* was described by Longman (1924)
from Tara Creek, northern Queensland, but is now considered an invalid taxon (Molnar 1982). *Quinkana fortirostrum* was a relatively small, terrestrially adapted crocodile with steep-sided snout and laterally positioned eyes, again clearly not resembling the petroglyph. A maxillary fragment has been reported from Lake Eyre Basin (Hecht and Archer 1977) but has been lost. *Gavialis papuensis* has not been reported from the Australian mainland so far, and *Mekusuchus inexpectatus* not from the Pleistocene (cf. Balouet and Buffetaut 1987).

In short, none of the Pliocene/Pleistocene crocodilians provides a credible model for the rock art motif at Panaramitee North, even if they were proposed to record a fossil skull: no such fossils of the last few million years have been reported from southern Australia. Moreover, the emic meaning of the motif was obtained from a Ngadjuri Aboriginal elder in 1942; it depicts a *yarida* magic object representing the spirit body of a human being as well as many other things (Berndt 1987). Some have countered that this may be a recently imposed indigenous interpretation of a depiction of a crocodile head, which is illogical considering that, on the basis of the empirical record, Aboriginal people of the region cannot be assumed to have been familiar with such reptilians, nor is it even likely to represent a fossil skull. It is much more probable that in observing such a complex petroglyph, the perception of cultural alien observers tries to detect meaning in the pattern. It does this by discovering prominent diagnostic features, such as the apparent symmetry of the figure, its ‘eyes’ and, less importantly, its ‘snout’, ‘nostrils’ and ‘sutures’. On this basis the beholder’s brain forms an opinion which is then reinforced by confirming features and rationalisation, ignoring all disconfirming elements. For instance, the large ‘eyes’ are evidently not crocodilian, and most of the patterning does not resemble that found on a crocodile’s head.

Similarly, the claims concerning the ‘fish’ image from Panaramitee North (Bednarik 2010: Fig. 29) or the ‘turtle’ petroglyph from Yunta Springs (Mountford and Edwards 1962: Fig. 2) evaporate upon close examination. The designation by a zoologist as a sea bottom marine fish was perhaps prompted by the placement of the two ‘eyes’ on what is intuitively seen as a dorsal view, ignoring that there are thousands of animal profile depictions in rock art showing two eyes, which are clearly not visible in reality (sometimes called ‘twisted perspective’). The opinion of a fish expert is of relevance in establishing the identity of a fish, but not in that of a depiction by an artist of a tradition whose imagery he is incapable of seeing with the very different perception of the artist. His Eurocentric perceptive processes prevent him from making a valid determination in the same way as Macintosh (1952, 1977) demonstrated that his exceptional anatomical experience was irrelevant in determining the meanings of hundreds of figures in Beswick Cave, Northern Territory. The misapplication of anatomical canons to alien systems of perception is one of the most common errors in the contemplation of rock art. It proceeds from the mistaken belief that all humans experience reality in the same ways, which is obviously a self-deception of considerable consequences (Bednarik 2012, 2013a; Helvenston 2013).

In the case of the Panaramitee North ‘fish’ — assuming that it was intended to depict a fish, which is not at all demonstrated — the proposition that it depicts a marine creature and therefore must date from a time when the sea was much closer to the site is an absurdity. Mountford and Edwards would be referring to the retreating Eromanga Sea of the Late Cretaceous period (peaking about 115 Ma ago) or the Early Eocene transgression (51 Ma ago), as the three Early and Middle Miocene eustatic events of high mean sea levels (Haq et al. 1987; Miller et al. 1998) were not of adequate magnitude to be considered (Panaramitee North is almost 300 m above present sea level; Mott 1998). The image could well depict a fish from the nearby river; the zoological perception of it having to be a marine species has no credibility. Similarly, if the purported turtle image at Yunta Springs is of the Quaternary, as must be assumed, it cannot be of a marine species, and it needs to be considered that the opinions of specialist zoologists about what is depicted in Aboriginal-created imagery are not relevant in identifying such motifs (see below). Dobrez (2010–11) makes the interesting point that, in respect of this general topic, Basedow, and later Mountford and Edwards, ‘looked to rock art for evidence to supplement archaeological searches for the coincidence of megafaunal and human vestiges in the fossil record’. In that sense, their endeavours were misguided: in science one needs to look for disconfirming evidence.

Some of these considerations also apply to the suggestion that tracks of *Diprotodon* have been found, although it is highly likely that some Pleistocene Aborigines were contemporary with this taxon. However, in

![Figure 6. Basedow’s depiction of a petroglyph he thought represents a Diprotodon track, and the tracks of the extant wombat.](image-url)
assuming that Gregory’s (1906) Kadimakara represents the Diprotodon it is being overlooked that, in the legends the monster ‘ravaged the country and devoured every living thing that came its way’, whereas the Diprotodon was a herbivore. Again, the part of the evidence that suits the preferred interpretation is retained, that which contradicts it (the scientifically more important) is discarded. Davidson (1936), in response to Basedow’s proposition (Fig. 6) of Diprotodon tracks at Yunta Springs and Wilkindinna, suggests that these could equally well be intended to depict the ‘poorly engraved feet of a Dreamtime anthropomorph’. A significant portion of Australian petroglyphs does indeed refer to creation myths, and this is likely to include fantastical creatures or tracks, and particularly the occasionally encountered excessively large tracks. The point is often made, including by Basedow and Mountford, that Aborigines, as expert trackers, are likely to take great care in reproducing precise depictions of tracks. Basedow suggests that the track of a Diprotodon might have been similar to that of a wombat, only much larger, but wombat tracks differ considerably from the petroglyph outline he provides from Yunta Springs. The form of the Diprotodon’s track would depend mostly on the foot’s soft tissue, and even Basedow’s (1914: Fig. 1) reconstruction of the Diprotodon foot does not match the petroglyph, nor does the rock art motif with its pointed toes and odd shape resemble a realistic track of the animal. If it is a track, which cannot be known, it is much more likely of a mythical being.

The issue is illustrated by the following considerations. Many undeniably human tracks in the world’s rock art are clearly oversized, yet this has not been presented as proof that a population of giants existed. It is then illogical to assume that all non-human tracks were made of naturalistic sizes. Just as large human tracks are likely to indicate non-physical qualities (rank, status, mythological attributes), similar considerations can also apply to non-human tracks. Moreover, the desire to detect meaning in strange rock art motifs can yield even stranger conjectures, e.g. when Mountford and Edwards (1964: Fig. 5E) describe the petroglyph shape at Red Gorge shown in Figure 7a as a ‘distorted example’ of a human footprint. Clearly this extreme view contradicts the expressed opinion of naturalistic veracity in the depiction of tracks: there is no reasonable justification for it. The root of the problem is illustrated with another example from Red Gorge (Fig. 7b). Basedow (1914:205) says about these petroglyphs ‘there is little doubt that two longhandled stone knives are intended. The pointed stone blades, the ball-attachment of resin, and the long wooden hafts are quite distinct’. Mountford and Edwards (1964: 857), however, suggest that these motifs illustrate two footprints ‘where a euro or kangaroo had rested on his heels’.

This brings into focus Basedow’s suggestion that one of the Red Gorge petroglyphs depicts a platypus. On this figure Mountford and Edwards (1964: 855) note that it ‘could depict either an echidna or a platypus’. While there is no certainty that it depicts either animal, if zoological considerations were applied it would resemble an echidna more closely (Fig. 7c): the tail is far too short and the platypus has webbed feet, not separated digits as indicated on two of the legs. But as the echidna remains part of the well-established fauna of the region its identification is less exciting. This indicates one of the biases that tend to creep into these identification endeavours, and it can be detected in all of the following examples cited in this paper: the proposers preferred a more appealing interpretation to one derived from applying Occam’s razor.

The most mysterious aspect of the claims that very large ‘bird tracks’ at Balparana Creek (Basedow 1907, 1914) and Eucole Creek (Hall et al. 1951; Tindale 1951) might depict the tracks of Genyornis is that both Basedow and Mountford studied the Red Gorge site, yet neither mentions the petroglyphs there that resemble large bird tracks. The Red Gorge specimens are
prominently located at the foot of the cliff, unlikely to be overlooked even in a cursory examination of the site (Bednarik 2010: Fig. 16). Be that as it may, large ‘bird track’ motifs occur at three sites at least, even though they differ considerably in their morphologies. Does repeated occurrence reinforce their identification?

As already noted, the size of a track is not necessarily a reference to naturalism, it can have a variety of alternative meanings, much in the same way as when in a group of anthropomorphs one individual is depicted much larger, not because one of the people was a giant, but because he was the leader, or the artist, or a deity etc. Thus size of a figure in rock art may have many meanings other than a reference to real size. Judging from the reconstructions of *Genyornis* (e.g. Murray and Vickers-Rich 2004: Figs 36, 37), its footprint should be between 15 and 20 cm long (Fig. 8). Yet the large ‘bird track’ petroglyphs average 45 cm, therefore the proposal of it being of *Genyornis* is illogical: it is based on its size, but it is of an incorrect size. Therefore the null-hypothesis should to be that the size is not indicative of realism, but is a variable expressing another connotation.

At least the apparent track petroglyphs in Red Gorge (Bednarik 2010: Fig. 16) are morphologically unlikely to resemble the tracks *Genyornis* is likely to have left, which renders it far more likely that they refer to a mythical being. McCarthy has long rejected the notion that tracks of *Genyornis* had been depicted at Eucolo Creek, on the correct basis that they are representative of a relatively recent tradition of Australian petroglyphs: ‘These tracks were pecked into the rocks in the latest phase of rock engraving, long after these giant animals became extinct’ (McCarthy 1967: 31). His view is reinforced by recent datings of the petroglyph types he refers to (Smith et al. 2009; Bednarik 2010). The greatest conundrum with Basedow’s and Tindale’s suggestion is that it demands carefully, it transpires that in all cases, the pro-

The evidence so far tendered in support of the contention is certainly inadequate, and a microscopic study of one of the Red Gorge ‘large bird tracks’ has detected very limited surface deterioration and granular exfoliation, combined with an absence of any indication of surface retreat (Bednarik 2010: 105). This is confirmed by the presence of at least five sets of what resemble dingo tracks, of similar weathering condition and age, at the same site. In fact Mountford and Edwards abandoned their 1962 assertion of the lack of dingo tracks in this tradition after their study of Red Gorge, which led them to the admission that their ‘earlier hypothesis [was] effectively destroyed’ (Mountford and Edwards 1964: 857). The dingo (Gollan 1984) is considered to be exclusive to the late Holocene (but see below), and like the ‘large bird tracks’, dingo footprints — if that is what they are — must be assumed to be of the late to final Holocene. Moreover, apparent dingo tracks occur also at the Eucolo Creek site (Hall et al. 1951). Thus there is no credible evidence in favour of the *Genyornis* hypothesis, at either site, while the evidence against it is overwhelming.

Similarly, the ‘identifications’ of iconographic rock paintings as images of *Palorchestes*, Zaglossus, Diprotodon, Thylacoleo and *Genyornis* are without exception contradicted by a variety of factors, some of which their proponents do consider. These taxons are all deemed to have become extinct well before 40 ka ago, as indicated by direct dates from fossil remains (Roberts et al. 2001; Grün et al. 2009; Prideaux et al. 2010), contrary to the Cuddie Springs claims. Cores from Lynch’s Crater in northern Queensland indicate that *Sporormiella* fungus spores, deriving mainly from the dung of mega-herbivores, disappear from the sedimentary record by 41 ka BP, implying that the large herbivores vanished about that time (Rule et al. 2012). There are no zoomorphs known in the world’s rock art older than 40 ka, and no rock paintings have been shown to have survived from the Pleistocene out of caves, or unprotected by silica or oxalate skins (these are henceforth referred to as ‘vulnerable’). This does not mean that such examples will not be found in the future, but the presently available data are unambiguous. Interestingly the claims made for Pleistocene zoomorphs in Australia refer generally to megafaunal species, which illustrates the circular reasoning: they are of large species, therefore they must be Pleistocene, which justifies their identification. No zoomorphs attributed to smaller species are being claimed to be of the Pleistocene, which confirms that these proposals are all based on perceptual biases. It is therefore important to note that etic opinion about visual diagnostics is the only basis of the propositions considered here, especially those of zoomorphs.

When the images and individual claims are considered carefully, it transpires that in all cases, the pro-
agonists supporting these contentions select a small number of attributes confirming their preferred readings, while ignoring disconfirming characteristics. This renders the claims unscientific, because of the emphasis science places on disconfirmation; rather than looking for confirming variables, the scientist focuses on refuting evidence. Although Murray and Chaloupka’s review of the image they suggest may be of *Palorchestes* lists many pros and cons of that reading, there are more significant obstacles. As they note, this genus is most inadequately known, and any palaeontological reconstruction involves a good deal of guesswork. From its naming by Richard Owen in 1873 to 1958, *Palorchestes* was thought to have been a giant macropod, until Woods (1958) noticed that it lacked a massecetrical foramen in the dentary. His find led to the destruction by the Australian Museum, to lessen any possible embarrassment, of a 3-m-high ‘reconstruction’ it had made shortly before this discovery (Fig. 9). This provides an example of how incomplete the knowledge of many extinct animals is, and how any reconstruction needs to be regarded as provisional, especially in such details as soft tissue, hair and colouring. The precise anatomical and especially visual characteristics of most Australian megafauna are either poorly known or unknown, and that applies particularly to such species as *Palorchestes* and *Genyornis*. The reconstruction of the first species offered by Murray and Chaloupka (1984: Fig. 11; here reproduced as Fig. 10a) provides hundreds of details, most of which are fictional, and it is not a reliable basis to begin from in any attempt to identify rock art imagery. But even if it were, and ignoring that this image was drawn in a pose to persuade the reader that it matches the form of the rock art image, the elements matching anatomically would be so minimal that it would not be justified to claim that the resemblance is adequate to identify an animal that is assumed to have become extinct long before the time the earliest ‘vulnerable’ pictograms can be demonstrated to have survived from (compare Figs 10a and 10b, bearing in mind that the latter is also an artistic impression, not an objective recording). If it were not for the presence of what appear to be four legs in Figure 10b, there would be very little to justify the description of the figure as a zoomorph, yet the ‘legs’, if that is what they are, bear no resemblance to those attributed to *Palorchestes*. In fact this ‘identification’ boils down to an endeavour to detect, in a figure that is clearly not a naturalistic image of any creature, the few visual clues that might be realistic and to then hope that they might be diagnostic in guessing the emic intent. This would not be justified if the outcome were a species of the recent past, and even less can it be justified when the species is one extinct for several tens of millennia — a spectacular contention that would demand spectacularly persuasive evidence. Clearly there are far more convincing interpretations.

The endeavours to find depictions of *Zaglossus* in Arnhem Land pictograms are similarly unproductive. It is not even clear which of the species of the relevant genera is supposed to be portrayed in the one suggested contender: *Zaglossus hacketti*, a megafaunal Pleistocene species, is not mentioned; *Z. bruijnii* is an extant species.

![Figure 9. Reconstruction of Palorchestes by the Australian Museum in 1958, destroyed shortly afterwards; the genus is now considered to be of the order Diprotodontia.](image)

![Figure 10. Comparison of another reconstruction attempt of Palorchestes, this one by Murray and Chaloupka (b), with their recording of a pictogram they suggest depicts that genus (b).](image)
in the highlands of western New Guinea and its time of extinction in northern Australia is unknown (it would have formed a single population across both regions up to 8500 yr; Hope and Hope 1976); the name *Zaglossus robusta* appears to be a conflation of *Z. robustus* and *Megalibgwilia robusta*, and *M. ramsayi* is misquoted as *Zaglossus ramsayi*. In summarising their discussion, Murray and Chaloupka concede that they ‘cannot be certain that representations of Zaglossus imply a Pleistocene date’ (1984: 108). Their recording (1984: Fig. 3c) has been shown to be unreliable (Lewis 1986: 144) and the image seems to combine elements of two separate individuals, the ‘long snout’ being the ‘tail’ of another ‘animal’.

### Identifying zoomorphs

These considerations of the difficulties of identifying species in Australian zoomorphs go to the very heart of the matter. If an image is fully naturalistic, such as the depiction of an animal in a zoological textbook, there can be little doubt about its meaning. Practically no such pictures exist in Australian rock art. Therefore etic interpretations of what are always abstracted or schematised designs depend entirely upon the selection of the correct diagnostic criteria, among the many characteristics available from any complex image. Therefore the epistemological issue is identical to that involved in the determination of the CCD (crucial common denominator) of phenomenon categories (Bednarik 1984: 29, 1985, 1990–91, 1994a) — in this case species or genera.

Some of Murray and Chaloupka’s speculations have been refuted by Lewis (1986), who challenged the veracity of several of their rock art recordings. For instance he demonstrated that, in trying to attribute a macropod pictogram to *Sthenurus*, they had connected incomplete legs that were superimposed ‘in a much darker pigment, with thicker lines and a cruder technique’ (Lewis 1986: 141) to a figure that already had complete legs. Significantly, he also notes that, in attempts to identify species in rock paintings, speculative details of extinct species should be omitted. He concludes that in their proposals, Murray and Chaloupka had placed ‘unwarranted emphasis on the overall shape and proportions … and insufficient emphasis on specific features’ (Lewis 1986: 145). In their reply, Chaloupka and Murray offer little in defence of their views, and focus on the identification of thylacines, making the important point that ‘the only feature which is unique to thylacines is the tail with a tuft of hair on its tip’ (Chaloupka and Murray 1986: 147; a probable thylacine from the Kimberley with a ‘tuft’ on the tail tip appears in Donaldson 2012a: 166).

The underlying model of this work is the rock art chronology of Chaloupka (e.g. 1993: 89), covering the entire period of human occupation of Australia. It is largely devoid of credible evidence, relying essentially on two factors: the purported identification of extinct megafauna as detailed above, and the view that there was an ‘estuarine’ period and a pre-estuarine period, related to sea-level changes. These constructs are derived from ‘identifications’ of superimposed paintings, but it would be well beyond the scope of the present paper to consider their merits. However, the bold proposal of Murray and Chaloupka (1984) of the presence of dingo depictions in the pre-estuarine, Pleistocene period questions the model severely. They would significantly predate the generally accepted appearance of the dingo in Australia at about 3500 yr (Gollan 1984), which renders it more likely that Chaloupka’s sequence needs to be compressed to fit into the Holocene. Since the main elements of his sequence compare well with those of the Kimberley, where preliminary scientific dating is available (Watchman et al. 1997), this is the most likely explanation, and perhaps his ‘dynamic figures’ are contemporary with the Kimberley Gwion traditions of roughly mid to late-Holocene times.

The most common examples of purported Pleistocene megafauna depictions, the five proposed identifications of *Thylacoleo*, illustrate the difficulties in identifying rock art zoomorphs. Murray and Chaloupka offer two examples, both of which present very few features reminiscent of the animal’s reconstructions (their version differs significantly from an earlier reconstruction attempt by Murray [1978: Fig. 4; see Fig. 13b below]). Both lack one of the most diagnostic aspects of the genus, the enlarged pollical (thumb) claw. Their Figures 6a and 6d, reproduced here as Figures 11a and 11b, show numerous details indicating that these are not anatomically accurate pictures of real species, but abstractions or schematisations whose form and details are determined by such factors as convention, style, perception and artistic ability. Therefore their selection of diagnostics is entirely arbitrary, and is a function of the conditioning of their visual perception. As such it is not relevant to the visual perception of the maker, which must be assumed to have been significantly different from that of the present beholder of the motifs. Since the proposed identification is extraordinary, and the extraordinary strength of the supporting evidence is
completely lacking, the probability of this claim being valid is miniscule. Moreover, it is of concern that in Murray and Chaloupka’s (1984: Fig. 6c) reconstruction of *Thylacoleo*, the animal has acquired a tuft of hair at its tail, apparently to match the two rock art images they present. At this point, accommodative reasoning has merged reconstruction and unidentified rock art motif into one.

The other three proposals for this genus provide even less justification, yet they were presented with greater confidence than those of Murray and Chaloupka. Akerman (1998) offers his recording of a ‘well-preserved’ quadruped pictogram from a ‘very exposed rock wall’ at an unspecified location near the lower King George River, Kimberley, which he defines as the image ‘of a leaping quadruped, possibly a *Thylacoleo*’. He incorrectly cites the previous suggestions by Murray and Chaloupka, which were properly qualified, as actual identifications (Akerman 1998: 118). His image (Fig. 12) is bereft of any diagnostic features pointing to *Thylacoleo*; in fact anatomically it would be more likely to depict a thylacine, and its posture resembles that of the two examples provided by Murray and Chaloupka, which were properly qualified, as actual identifications (Akerman 1998: 118). His image (Fig. 12) is bereft of any diagnostic features pointing to *Thylacoleo*; in fact anatomically it would be more likely to depict a thylacine, and its posture resembles that of the two examples provided by Murray and Chaloupka, which were properly qualified, as actual identifications (Akerman 1998: 118).

His image (Fig. 12) is bereft of any diagnostic features pointing to *Thylacoleo*, in fact anatomically it would be more likely to depict a thylacine, and its posture resembles that of the two examples provided by Murray and Chaloupka. Akerman perceives his example as ‘leaping’, which illustrates the highly subjective nature of these pronouncements: what appears to be dead to one alien beholder seems to be leaping to another. Eleven years later Akerman ‘discovered’ a second image he believes to be of *Thylacoleo carnifex*, this time among the photographs of a rock art enthusiast who had visited a site in the Kimberley region of Western Australia. Without examining the site, relying on three photographs by the tourist, Akerman published a paper in an international archaeology journal, confidently proclaiming that with the finding of the 2008 figure however we have indisputable evidence that some early Aboriginal people were not only familiar with megafauna, in this case, *Thylacoleo carnifex*, but also recorded the salient features of this, now long extinct, animal in a manner that resonates across the millennia (Akerman and Willing 2009).

This ‘indisputable evidence’ consists of Akerman’s opinion that the image resembles his preferred interpretation more than it resembles *Thylacinus cynocephalus*, and that the ‘tufted tail-tip’ points to the *Thylacoleo* depictions of Murray and Chaloupka. This requires some clarification. The presence of a tail-tip tuft of hair on thylacines is historically known, but nothing is known about the appearance of the tail of *Thylacoleo*. Similarly, the distinctively striped markings of the thylacines are well known, whereas nothing is known about the fur, if any was present, on the alternative genus. The tail-tip tuft on the two Arnhem Land images, which also resemble *Thylacinus* more than *Thylacoleo*, provides no support for the depiction of *Thylacoleo*. Moreover, the tail detail he attributed to the image is not even from the same motif, but belongs to another, largely incomplete motif nearby (Fig. 13a), which he interprets as a second individual of the same species from a body part that is lacking on the first figure. Evidently his eagerness to confirm his own 1998 claim has led to his careless reasoning, instilling new meaning in the proverb ‘painting the lion from the claw’: Akerman identifies an image from a body part not present on the image, that is not even diagnostic for the species he names, but for another he eschews, and which also bears the striped body depicted in the motif. Also, the prominent and pointed ears Akerman himself observes are unlikely to be of his favoured genus, but occur on many of the generally accepted rock art images of thylacines (Fig. 14). *Thylacinus* became extinct on the Australian mainland less than 3000 years ago (Lowry and Merrilees 1969; Archer 1974; Paddle 2000; Johnson and Wroe 2003; Johnson 2006; Gale 2009), and in Tasmania only in the early 20th century, therefore its anatomy is well known.

Having not even seen the Kimberley figure or examined its context or the state of claimed superimpositions...
(including two Gwions, reportedly of Wararajai and Mambi Gwion figures, using Donaldson’s [2012b] terminology), Akerman’s report was premature and its precipitate publication preserved imaginative statements proper refereeing would have challenged, such as: ‘The artist’s understanding and appreciation of the particularly dangerous nature of the forelimbs and paws may possibly be inferred by the apparent differentiation in emphasis between the fore and hind limbs.’ It can be seen that the application of such canons to rock art would yield countless entertaining but worthless assertions, yet it is evident from the literature that much archaeological discourse about rock art consists of such vacuous arguments, in which the interpreter deduces intention, purpose and meaning from patches of pigment on rock.

Not content with ‘identifying’ two images of Thylacoleo in the Kimberley, Akerman (2009) went on to present yet another example of this genus, this time from the lower reaches of the Drysdale River. The painting he illustrates closely resembles both the living animal and other images presumed to depict thylacines, including the only example known from Victoria (Gunn 2002: Fig. 10). He associates the zoomorphs with what he states represents a multi-barbed spear, a weapon probably of the most recent history of Australia (Davidson 1934), and his only support of the notion of great antiquity is that there is no spearthrower involved. This conflicts with the view that Mungo man (WLH-3) suffered from ‘woomera elbow’, i.e. severe osteoarthritis in the right elbow (cf. Habgood and Franklin 2008).

Other attempts to identify extinct animals in Australian rock art are either too poorly presented to warrant analysis or provide no implications of Pleistocene antiquity (such as the depiction of ‘fat-tailed kangaroos’). There is one more prominent proposal deserving of analysis. Gunn et al. (2011) present an image from a sandstone stack at the headwaters of the Katherine River, western Arnhem Land, as a possible depiction of Genyornis newtoni. In contrast to Akerman’s presentations, their paper is very well prepared and documented. There are few subjective statements, such as the description of the aviform painting’s pose as being ‘clearly deliberate’, or the assumption that ‘the figure is portrayed in a stylised pose in which particular traits are over-emphasised’ (Gunn et al. 2011: 6). The remains of Genyornis, in the form of bones, eggshell fragments and possible tracks are geographically limited to the southeast of the continent, and Gunn et al. correctly note that ‘the likelihood of finding fossil remains of any Pleistocene fauna in Arnhem Land is extremely remote’ (which would also apply to Holocene finds of such genera as Zaglossus). However, there are nearby limestone regions with caves, and the apparent absence in them of eggshell, so plentiful even in exposed sand deposits of SE Australia, diminishes this argument. The principal contentions against the proposition by Gunn et al. are again the selective use of iconographic diagnostics and the taphonomical context.

The first concern is that the authors selected from a complex image a few aspects that support their preferred interpretation, ignoring those that overwhelmingly contradict it (Fig. 15). The second relates to the site’s geology and topography: it is on rapidly eroding sandstone, located under a narrow roof, in a tropical monsoonal climate zone experiencing heavy storms and rains. As a consequence the pigment shows extensive water damage, partly from rain driven into the shallow recess, partly from water seeping out of several bedding planes in the sandstone forming it. No rock painting in the world has been shown to have survived in such a ‘vulnerable’ position from the Pleistocene or most of the Holocene. Indeed, there are many excellent records showing the extensive damage suffered by similar...
paintings in northern Australia since the time they were first recorded by 19th century explorers, which suggests that these motifs will in most circumstances not survive for more than a millennium (e.g. Donaldson 2011: 23–29; cf. Trezise and Wright 1966). Gunn et al. concede that the handstencils superimposed on the aviform motif are of a specific type considered contemporary with Chaloupka’s dynamic style, which has been suggested to be around 10,000 years old. However, as this tradition (if that is what it is) is more likely in the order of a few millennia old, this would attribute the bird-like figure to the late Holocene, an age much more acceptable in the context of its taphonomy and small-scale geomorphology. All sandstone exposures are subjected to constant granular and mass exfoliation as they are being reduced to sand, and the crumbling remnant on which this painting occurs is no exception. The proposition that the pictogram could be at least fifty millennia old implies that this is the world’s oldest rock painting, significantly exceeding in age the hermetically sealed-off rock art in deep limestone caves of France. It is rendered even more indefensible by being from a region that has not yielded any Genyornis eggshell finds so far, being based purely on a small number of confirming visual characteristics, while disconfirming (scientifically more relevant) characteristics are explained away. Gunn et al. (2011: 2) note that ‘maritime historians have little trouble interpreting the type and country of origin of non-Aboriginal watercraft’, but fail to mention why these interpretations necessarily need to be correct, being unfalsifiable as they are. Most importantly, the image is unquestionably not a naturalistic rendering of any real creature; its point of gravity is so severely displaced that the standing ‘bird’ would immediately fall on its beak. The complete absence of any tail feathers, so characteristic of all large birds (ostrich, rhe, moa, emu), confirms that this is not a naturalistic image, as does the depiction of the feet, which renders the selection of diagnostic traits completely arbitrary. The long thin neck is not of Genyornis, and as there are no undamaged specimens of Genyornis’ head on record, to cite this anatomical aspect is premature. A distinctive line across the body could indicate a wing line or the alimentary canal. In the former case it would refute depiction of Genyornis; in the latter it would confirm other aspects suggestive of x-ray treatment. Gunn et al. note the last-mentioned, which would place the image within the last couple of millennia, corroborating all other age indicators, but they reject this reading as it would disproof their favoured interpretation. Their appraisal would benefit from a preference of disconfirmation, the hallmark of science.

Discussion

One of the principal factors speaking against the ‘identifications’ of megafauna species in Australian rock art is that none are petroglyphs, which tend to suffer considerably less from taphonomy than do all forms of pictograms — especially on weathering resistant rock types (Bednarik 1994b). All these paintings are ‘vulnerable’, i.e. in relatively poorly protected locations, and all are on sandstone. If they were of the Pleistocene they would be the only Pleistocene paintings in the world found in such ‘vulnerable’ settings. Therefore, at this point the extraordinary nature of these proposals must be appreciated. There are many limestone caves with rock art in Australia (Bednarik 1990), and this cave art has in some of them been shown to be of the Pleistocene (Bednarik 2010), yet it is very different and certainly includes no zoomorphs. Indeed, preliminary credible dating information pointing to the Pleistocene is available for many Australian rock art motifs, but none of these is considered figurative. After the extraordinary results of numerous cation ratio analyses of several sites in the vicinity of Panaramitee North were withdrawn by Dorn, the only scientific dating information from this series of sites (Watchman 1992a; Smith et al. 2009; Bednarik 2010) suggests that these petroglyphs, believed by many archaeologists to be of the Pleistocene, seem to be generally at the most a few millennia old. On the basis of current believable information, all Pleistocene rock art in Australia, belonging as it does to Mode 3 (Foley and Lahr 1997) industries (which in Australia continues well into the
Holocene), is nonfigurative — as is all Mode 3 rock art in the rest of the world (Bednarik 1995b, 2003; Beaumont and Bednarik 2013). The only exceptions would be the images purported to be of megafaunal species and their tracks as listed here, all of which are based purely on the visual perception of the proponents. If the only attributions of figurative Australian rock art are those relating to claims of megafauna, arrived at by circular reasoning, the application of Occams razor would imply that there is no evidence of figurative rock art in the Pleistocene, and this agrees with all other findings. So far not one of the supposed megafaunal depictions has provided any direct dating evidence, but this may change sooner rather than later. Nor has a Pleistocene antiquity been demonstrated for any figurative imagery in Australia — which is rather less likely to change in the future. Any claims of this nature need to be supported by extraordinarily strong empirical evidence, and archaeological opinions about meaning do not constitute evidence of any consequence.

This brings into focus the perceptive and neurological processes involved in the ‘identification’ of rock art motifs. Before considering this aspect it needs to be emphasised that the imprudent identification of rock art imagery is not an issue specific to Australia; it is a universal issue. It is actually far more common in most other parts of the world, because most Australian rock art researchers have long accepted the dictum that they cannot identify motifs, which is well expressed in the Australian convention of placing ‘identifications’ in quotation marks. This is the result of Macintosh’s seminal 1977 paper, and it is particularly relevant to note that Australia is universally agreed to provide the most substantial and reliable emic information about rock art meanings: the quality and quantity of sound ethnographic information about rock art meanings: the quality and quantity of sound ethnographic information is unmatched in the rest of the world. Therefore Australian examples of eagerness in interpretation, limited to megafaunal or exotic meanings as they are, seem rather incongruent. A recent example of an exotic claim refers to the ill-named Deer Rock (or Reindeer Rock) site in the Kimberley, which some archaeologists have claimed to provide numerous depictions of exotic animals. Welch (2012) has shown convincingly that the ‘deer’ depict in fact Aboriginal dancers.

Further afield there have been thousands of proposals of estimating the age of rock art by identifying the objects supposedly depicted in it. They range from the plausible to the improbable; and from there to the extremely far-fetched and the absurd. Paradising these claims here would double the length of this paper (this author has reviewed some of them on various occasions), so here it will have to suffice to consider just one of the most extreme claims. The purpose is not to disparage these proposals, but to illustrate the futility of their logic. A group of petroglyphs in Inner Mongolia, China, were identified, by exactly the same neurological processes that underpin the cited Australian examples, as depicting giraffes (Fig. 16). The genus Bohlinia expanded into China during the Miocene, but there is no evidence of Giraffidae from the Pleistocene, so in 1990 the petroglyphs were placed in the Tertiary, representing the earliest rock art of the world. (The petroglyphs seem to precede the return of the giraffe to China in 1414, when Zheng He introduced a specimen to the Ming Dynasty zoo.) Recently Welch (2012: Fig. 12) has presented ‘giraffe’ images from the Kimberley region, but his better informed interpretation has spared Australia the need to consider the possibility that giraffes once existed in that continent.

There is no logical difference between the claim that an image of a group of giraffes proves its antiquity, and the claim that an image of Thylacoleo proves its age. Clearly in both cases the question is: what prompts the interpreter’s belief of the meaning inherent in patches of pigment or arrangements of anthropogenic depressions on rock? Neuroscientifically, rock art interpretation is related to the processes involved in apophenia and pareidolia, which are Type 1 Errors (false positive or alpha errors). Apophenia refers to the human tendency to seek patterns in random information, which is of fundamental importance in the ability of a species in processing sensory input. The human inclination to detect connections between seemingly unrelated objects or ideas seems to link creativity to psychosis (in the sense of normal aberrant experiences). High levels of dopamine affect the propensity to find meaning, patterns and significance, even when there is none, and this proclivity is related to a tendency of receptivity for the paranormal (Leonard and Brugger 1998). Alcock emphasises how evidence that should be rejected on a rational basis is instead accepted by default, and rationality changed to fit the perceived evidence...
imaginary (causal fallacy). 'Associative thinking', which
sense, human skills in inferring connections are perhaps
with limited control over their beliefs. In an evolutionary
causality in coincidence. The brain is 'wired' to find
magical thinking is also a form of apophenia, detecting
that share one common factor: they are centred on
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inkblot test uses the phenomenon in an attempt to gain
wired'. In a form of 'directed pareidolia', the Rorschach
recognition of faces, for which the human brain is 'hard-
advantages, particularly in its most frequent form, the
(1995: 45) suggests that pareidolia bestows evolutionary
variability, ranging from normal perceptive reactions
(e.g. seeing, for a moment, a snake where there is a
tree root on the ground) to, at the other extreme end
of the spectrum, strong psychotic convictions. An
understanding of the role of pareidolia is of fundamental
importance to the study of palaeoart, to appreciating
the functioning of the perception of palaeoart creators,
and to identifying its role in the perception of rock art by
the modern beholder. Unfortunately rock art research
lacks a comprehensive analysis of the relevance of pa-
reidolic perception to this field, nor is it attempted to
be presented here. However, it will suffice to consider
some of the underlying main issues.

Pareidolia allows the creation of order out of the
chaotic input of visual and audible sensory
input. This author has, over the past 30 or 40 years,
received hundreds of communications (and samples
weighing up to 30 kg!) from people who believe they
are seeing images in unmodified, randomly patterned
or shaped rocks, from finger-nail size to massive
granite tors (cf. also Helvenston and Hodgson 2010).
Like apophenia, pareidolia is a phenomenon of great
variability, ranging from normal perceptive reactions
(e.g. seeing, for a moment, a snake where there is a
tree root on the ground) to, at the other extreme end
of the spectrum, strong psychotic convictions. An
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Pareidolia allows the creation of order out of the
chaotic input of visual and audible stimuli; but it can
also impose sense on input that is in fact random. Sagan
(1995: 45) suggests that pareidolia bestows evolutionary
advantages, particularly in its most frequent form, the
recognition of faces, for which the human brain is 'hard-
wire'. In a form of 'directed pareidolia', the Rorschach
inkblot test uses the phenomenon in an attempt to gain
insight into a person's mental state (Zusne and Jones
1989: 77–79). In examining anomalistic psychology,
these authors raise the highly relevant issue of 'magical
thinking', a clinical term used to describe a wide variety
of non-scientific and sometimes irrational beliefs
that share one common factor: they are centred on
correlations between events or phenomena. Therefore
magical thinking is also a form of apophenia, detecting
causality in coincidence. The brain is 'wired' to find
meaning in the world, a predisposition leaving humans
with limited control over their beliefs. In an evolutionary
sense, human skills in inferring connections are perhaps
'over-tuned', because in natural selection missing the
obvious tends to be more detrimental than seeing the
imaginary (causal fallacy); 'Associative thinking', which
is perhaps a better term than 'magical thinking', was
considered by E. B. Tylor (1920) as 'pre-logical', and
was the default mode of human thought before the
advent of causal reasoning, i.e. scientific reasoning
(Helvenston 2013). Indeed, it is the natural human
tendency, and even the behaviour of most present-day
conspecifics remains deeply rooted in magical thinking-
type mental processes. These are attributable to a lack
of integration between the left hemisphere prefrontal
cortices and memory, and sub-optimal cause and effect
perception (Bednarik 2012), a faculty that needs to be
learned ontogenically. Sophistication in cause and effect
reasoning is not a function of inherent human behaviour.

In applying these generalisations to the issues at
hand it is self-evident that the most pervasive human
reaction to rock art, irrespective of the age, ethnicity
or conditioning of the beholder, is a palpable urge to
try to figure out what it depicts and what it means.
The visual system involved in this comprises the eye
and its parts, the optic nerve/chiasm, thalamus (lateral
genulate nucleus), primary visual cortex/occipital lobe
(V1) and visual association cortex. The identification
and categorisation of visual information is via the
ventral stream, connecting to the medial temporal
lobe, limbic system (evolutionarily primitive brain
structures located on top of the brainstem) and dorsal
stream (from primary visual cortex to parietal lobe)
(Mishkin and Ungerleider 1982). The process is no
different from that of decoding any other visual input,
particularly that which is of a nature not permitting
correct identification almost instantly. The activity is
precisely the same as that facilitating pareidolia: as the
information is processed, as neurons send back and
forth excitatory and inhibitory messages, the image
is scanned for elements stored in the visual cortex. As
recognition emerges, confirming evidence is collected,
reinforcing it, leading to the 'aha!' moment when ex-
cutive control in the frontal lobes records a positive
detection, even though the perceived image may not
exist in reality.

In the case of rock art motif identification, most
motifs lack an 'ideal' set of diagnostic aspects, and
then the effectiveness of this process of detecting
meaningful patterns in the visual data and interpreting
them is determined by the state of interconnectedness
of the various brain regions involved as well as other
factors, such as the degree of integration between the
left prefrontal cortical areas and memory. The level and
volume of prefrontal cortex activity is widely variable
among individuals (as is the susceptibility to pareidolia)
and, depending on the amount of integration it faci-
litates, degrees of constellated psychic contents become
more or less available for conscious analysis. But
whereas in pareidolia, the low connectivity between the
hemispheres responsible for 'magical thinking' determines susceptibility, there is another crucial
factor in the neurophysiological limitations of rock art
interpretation. It is the susceptibility to autosuggestion
that contributes to the conviction that the modern
The beholder’s visual perception is capable of extracting emic meaning from pigment traces or petroglyph marks made in pre-History. This misconception seems to be attributable to the view that modern mentality and behaviour can be attributed to all humans since 30 or 40 millennia ago. That error is so ingrained in orthodox archaeology that it seems almost impossible to correct, and yet it is self-evident that practically all rock art was created by non-literate people. They *most certainly* had no ‘modern minds’. The plasticity of the human brain facilitates its modification by ontogenic experience: the brain of a literate person differs significantly from that of a non-literate person, in its structure, interconnectedness and level of integration. Neuroscience has demonstrated that cultural activity modifies the chemistry and structure of the brain through affecting the flow of neurotransmitters and hormones (Smail 2007) and the quantity of grey matter (Maguire et al. 2000; Draganski et al. 2004; Malafouris 2008). Helvenston (2013) has explained convincingly that the brains of literates and of people with oral-aural traditions are very differently organised and connected. Those of non-literate operate largely through ‘magical thinking’, whereas the operation by cause and effect reasoning is, as noted, acquired *ontologically*. Therefore the most reliable modern interpreters of rock art should be infants, followed by illiterates. The least qualified are modern academic sophisticates (Bednarik 2011, 2012, 2013a).

In a neuroscientific sense it would therefore be naive to think that ancient creator and modern viewer of rock art share the same brain, perception, graphic convention or belief system. Rock art interpreters will need to learn that when Macintosh several decades ago conceded that he, as an eminent professor of anatomy, was unqualified to interpret biomorphs in rock art, he meant precisely that. The same applies to palaeontologists or zoologists: they are trained to identify the species or their remains; they have no innate understanding whatsoever of alien palaeoart imagery, and their pronouncements about it are less relevant than those of illiterates.

To illustrate with an example that most rock art is not naturalistic, Figure 17, the recording by George Chaloupka of a painting from Arnhem Land is considered. This image is experienced by most people as depicting a horse and rider. Perhaps that is what it represents, but there is not a great deal of detail in it that is truly naturalistic. On the contrary, most detail, such as the face of the ‘rider’, is more reminiscent of Picasso than of naturalism. Indeed there is hardly a rock art image among the many millions of Australia that is genuinely naturalistic. Therefore to assume that a few images purported to depict megafauna offer ‘naturalistic’ diagnostics is, in the absence of any other evidence, illogical. Besides, it has been shown here that these presumed diagnostics are not even diagnostic of the species claimed to be depicted.

Conversely, dinosaur tracks have been depicted in a number of cases in rock art: in Utah such a pictogram occurs close to sets of dinosaur footprints; petroglyphs of them have been found in Arizona and Wyoming; in Algeria legends of a colossal bird relate to Cretaceous dinosaur tracks; while in Australia, the legend of Marella, the Emu-man, derives from theropod tracks (Mayor and Sarjeant 2001). At least one instance is known of palaeoartists having not only portrayed a dinosaur track, but even depicted the Mesozoic ornithopod rather accurately (Ellenberger et al. 2005). The simplistic rationalisation, as employed in the above-listed Australian examples, would then be that humans and dinosaurs must have coexisted; the alternative explanation, involving the competence of ethnoscientists of pre-History, is not only preferable, it is even more exciting. After all, these traditional scientists outperformed palaeontologists: their three reconstructions as recorded by the young Ellenberger in 1930 are clearly superior to that of Sir Richard Owen of a quadrupedal ornithopod (see also above, concerning *Palorchestes*). Perhaps it needs to be made much clearer that palaeontological reconstructions, although perhaps improving with time, are still only artists’ impressions. Comparing these with the representations of artists of greatly differing cultural, perceptive and cognitive background is not a sound line of reasoning.

*Figure 17. Recording by George Chaloupka of a pictogram from Arnhem Land, Northern Territory.*
Summary

In this paper it has been attempted to show that not a single one of the numerous claims that megafaunal species/genera or their tracks have been depicted in the rock art of Australia is sustainable. Such propositions have appeared for more than a century, and their frequency has increased after the middle of the 20th century, rendering it necessary to review them critically. More such claims are understood by the author to be in the making. Similar notions have been expressed in all continents except Antarctica, at some time or another, one of the more prominent recent claims being that by Malotki and Wallace (2011). (It is to be investigated by scientific means during 2013.)

As observed by Patricia Dobrez (2010–11), in Australia these claims were initially made in order to demonstrate coincidence of megafaunal and human vestiges, but more recently they were also used in underpinning questionable rock art chronologies. This includes not only three northern Australian regions where megafaunal ‘identifications’ have propped up rock art attributions to the Pleistocene, but also concerning the false ‘Panaramitee style’ that has been claimed to include most petroglyphs from Broken Hill to Alice Springs, i.e. in the central regions of Australia. This invented style, touted to be the first in a sequence of imaginary styles, has long been ascribed to the Pleistocene. The limited credible scientific dating of examples of this ‘style’ suggests that the petroglyphs are of the late Holocene, and yet this false perception is so entrenched that some Australian archaeologists still continue to defend it. Analytical examination of some of these ‘Panaramitee’ sites shows that they are cumulative assemblages representing a wide range of ages rather than a single tradition (Bednarik 2010: 99–101), which explains why they seem to combine older and more recent elements. However, especially in the ‘heartland’ of this ‘style’, the region to the east of Peterborough in South Australia, the lithologies on which these petroglyphs occur are generally low-metamorphism rocks of poor resistance to weathering (dolomitic siltstone, tillite, schist, phyllite, slate). Therefore the Pleistocene claims were always dubious, and that also applied to the contentions concerning the depiction of megafauna tracks at a few of these sites.

This paper also considered the neurological basis of the megafauna assertions, showing that etic interpretation of rock art is unacceptable because ancient creator and modern viewer of rock art share neither the same brain nor the same perception, not to mention graphic convention, culture or belief system. All of these contribute significantly to determining what humans see and how they see it or create imagery, and to the visual disambiguation strategies of their neural systems.

Rock art interpreters need to accept that, in the final analysis, the claim that an Australian pictogram’s meaning proves its age is logically not different from the Chinese claim that some ‘giraffe’ petroglyphs prove their age. Although it is perfectly legitimate to speculate about the meaning of rock art, it bears repeating that no scientific significance can be attributed to the ‘findings’ of such a pursuit — except in one area of science: in the study of the interpreter’s perception, neural function and construct of reality.

Acknowledgments

The author thanks Dr Livio Dobrez and Dr Keryn Walsh for arranging the viewing of the Panaramitee yrinda petroglyph, and Traditional Custodian Quenten Agius Narungga for special permission to view it; RAR referee Professor June Ross is thanked for her eminently constructive critique of the paper. Its numerous remaining shortcomings are entirely the author’s responsibility.

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