



KEYWORDS: *Pleistocene – Palaeoart – Iconographic identification – North America*

PLEISTOCENE FAUNA DEPICTIONS IN AMERICAN PALAEOART

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Abstract. The numerous published claims concerning the depiction in North American rock art and portable palaeoart of Pleistocene animal species, and in some cases even of Mesozoic species, are examined. Such proposals have appeared since the 19th century and have involved petroglyphs, pictograms and mobiliary art. Patterns in the consideration of the evidence presented in their support are analysed and the rationales underpinning these various claims are examined in an attempt to explain their apparent foundations. This review yields no credible evidence for the depiction of extinct fauna in the United States or any other parts of the Americas.

Introduction

An analysis of the many claims of Pleistocene megafauna depictions purportedly occurring in Australian rock art has been presented recently in this journal (Bednarik 2013a). It was argued that none of the many such proposals presented for over one century had offered credible evidence, either for Pleistocene antiquity or for actually depicting Pleistocene species (including assertions concerning presumed tracks of megafauna). It is particularly apparent that there is not a single contention of a non-megafaunal zoomorph being of the Pleistocene; therefore it appears that there is a connection between the pareidolic 'identification' of the various megafaunal depictions and their proposed ages. In fact in most cases it is argued that it is the mistaken identification that drives the age claims, none of which are likely to be confirmed by scientific analysis, as has been shown previously (Bednarik 2013a) and will be contended again here.

What can be learned from this analysis is that each apparently iconic rock art motif comprises both naturalistic and non-naturalistic elements: some details are subjectively judged to be realistic, most are considered to be 'schematised' or 'poorly drawn'. All viewers of such images feel a palpable urge to try guessing what they depict and what they mean. This applies equally to small children, to 'researchers' and to people of any ethnicity or cognitive conditioning. In order to accomplish this, the beholder's visual system has to scan the pigment patches or petroglyph depressions constituting rock art, seeking to detect arrangements it 'recognises' as resembling parts or aspects of objects (Gerrits and Vendrik 1970; Mishkin and Ungerleider 1982; Olshausen et al. 1993; Wallis and Rolls 1997;

Kandel et al. 2000; Troscianko et al. 2009; Hinton 2010; Xiwu et al. 2011): 'When faced with ambiguous sensory inputs, subjective perception alternates between the different interpretations in a stochastic manner' (Wang et al. 2013). As formal details of rock art motifs seem to offer identifying clues a first (stochastic) impression is formed, confirming features are sought, disconfirming ones are subconsciously disregarded or experienced as evidence of 'poor draughtsmanship'. An 'identification' is established rapidly, within a second or a very few seconds. From there on it becomes relatively difficult for the viewer to imagine the motif depicting something else. Arrangements resisting identification are explained as being 'unidentifiable', or alternatively as depicting fantastical beings, such as therianthropes, spirits or other products of the imagination.

On that logical basis the 'identifications' of rock art imagery are always questionable, and there is also sound empirical evidence to show that they tend to be false far more often than not (especially Macintosh 1977). Epistemologically pareidolic identification of rock art motifs is generally unfalsifiable and untestable. It can be presented as hypothesis but should never be used as the basis of derivative hypotheses, such as the proposition that an image must be Pleistocene because of its perceived iconographic content. In the following sections of this paper propositions of this kind are described and assessed. However, as there are several claims for the depiction of Mesozoic species in North American rock art it is advisable to begin with them, before moving on to Pleistocene contentions. This will establish the underlying format of these proposals, because the notion of the depiction of Mesozoic fauna is logically no different from that of Pleistocene fauna:

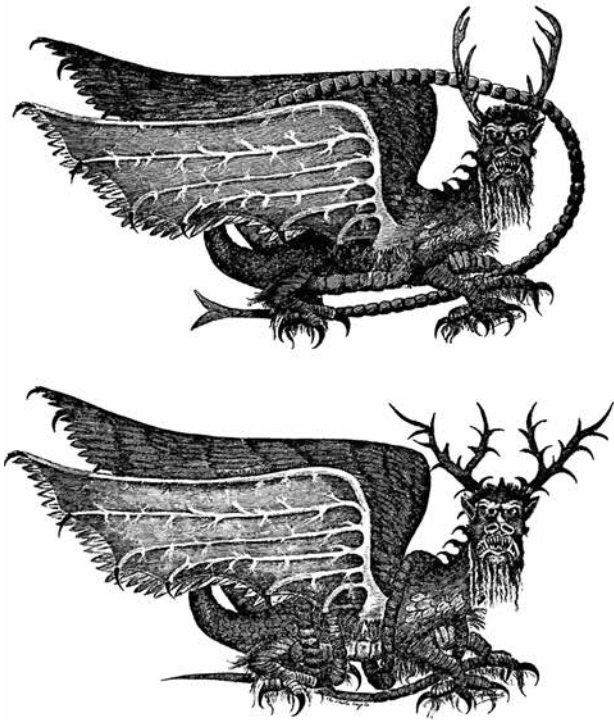


Figure 1. Rather fanciful reconstruction of two rock paintings near Alston, Illinois, attempted decades after their destruction (after Armstrong 1887).

in both cases it is based on pareidolic 'identification' and in both cases it leads to the derivative hypothesis that humans depicted these animals.

Dinosaur rock art

One of the earliest claims for the depiction of dinosaurs or pterosaurs in rock art concerns a pair of rock paintings first described by the French explorers Jacques Marquette and Louis Joliet of a creature called the Piasa Bird (Marquette 1855). They saw them on a cliff on the Mississippi near Alton, Illinois, in 1673:

As we coasted along rocks that were awful for their height and length, we saw on one of the rocks two painted monsters that made us afraid and upon which the hardest savages dared not long rest their eyes. They are as big as a calf, they have horns on the head like deer [or possibly goats], an awful look, red eyes, a beard like a tiger's, the face something like a man's, the body covered with scales, and the tail so long that it makes a turn all around the body and passes under the head and returns between the legs and ends in the tail of a fish (Marquette 1855, translation by Phil Senter).

Marquette's observation is the first published record of rock art in North America, north of Mexico (Bednarik 2007a: 8). By 1698 the images were nearly effaced, according to missionary J. F. Buisson de Saint-Cosme (Temple 1956), due to the practice of passing Native Americans to fire arrows and bullets at them. Eventually, in the middle of the 19th century, the cliff bearing the remains of the large images was quarried. Only fanciful impressions of the images survive (Fig. 1). Armstrong (1887) saw them as depicting pterosaurs (*Rhamphorhynchus*), as did Gibbons and Hovind (1999)



Figure 2. Rock art motifs interpreted as depicting dinosaurs: (a and b) Havasupai Canyon, U.S.A.; (c) Agawa Rock, Canada.

much more recently. Using relevant ethnography, Senter (2012) has shown persuasively that the most likely meaning of the two motifs is that they depicted Underwater Panther or Mishipizhiw, a mythological creature of the Great Lakes region. It possesses horns and is probably related to the horned serpent theme widespread in North American mythology.

Another claim of a sauropod depiction in rock art originates from members of the 1924 Doheny expedition into Havasupai Canyon, northern Arizona, who reported an image of *Diplodocus*. Samuel Hubbard, Curator of Archaeology at the Oakland Museum in California, initially advanced this proposition (Hubbard 1927). His reasoning was that '[t]he fact that the animal is upright and balanced on its tail would seem to indicate that the prehistoric artist must have seen it alive' (Hubbard 1927: 9). The petroglyph motif is simple and schematic, and whatever it depicts, it offers little anatomical detail to assign it either to *Diplodocus* or *Edmontosaurus*, the second interpretation favoured by Taylor (1987). Since the presentation of this 'sauropod' image, Beierle (1980) has described a second motif from the same panel and at a similar level as an unspecified dinosaur. He considered the first motif to possibly depict a llama. Senter (2012) has examined both petroglyphs and considers the first to be of a bird, the second of a bighorn sheep, noting that the second image does not resemble any known kind of dinosaur (Figs 2a, 2b).

One of the most spectacular misidentifications of rock art as depicting dinosaurs is the alleged pterosaur painting in Black Dragon Canyon, Utah (Barnes and Pendleton 1979: 201). Warner and Warner (1995) have analysed the assemblage and determined that five separate red pictographs, two anthropomorphs and three zoomorphs, have been combined as one hypothetical motif. The false impression is emphasised by some areas of pigment wash and the effort of one rock art interpreter who has helpfully drawn a chalk line around the area he or she perceived as a single motif. Senter (2012) confirmed the observations of the Warners and his recordings are reproduced in Figure 3. Then there is the purported sauropod petroglyph at Kachina Bridge in the Natural Bridges National Monument, also in Utah (Swift 1997; Taylor 1999; Butt and Lyons 2004; Lyons and Butt 2008; Isaacs 2010; Nelson 2011). Senter and Cole (2011) have debunked this myth by showing that the 'legs' of the perceived

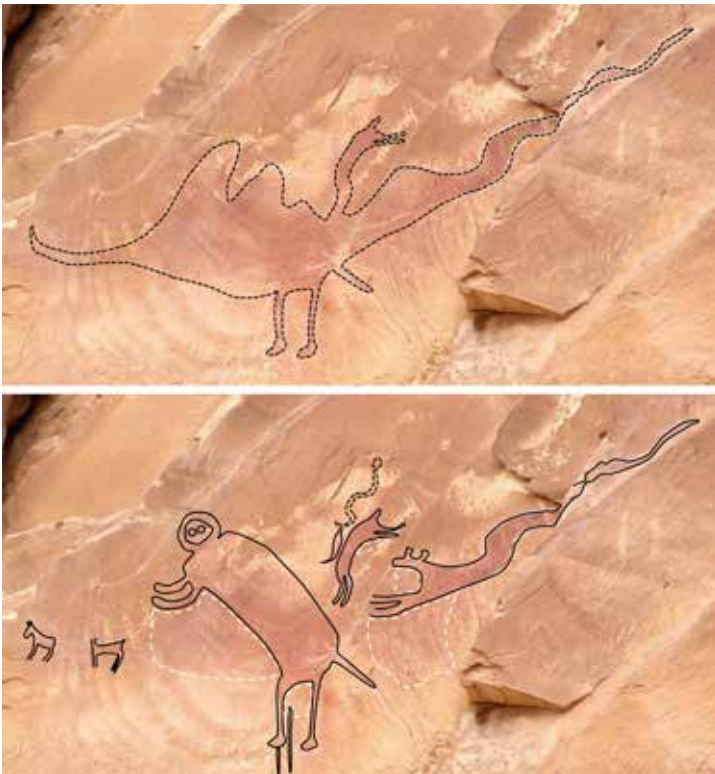


Figure 3. Analysis of the Black Dragon Canyon 'pterosaur' by Senter (2012), confirming that it consists of several separate motifs.

image are natural mineral stains and the body consists of a pair of sinuous, snakelike petroglyphs.

Further afield we have one more claim by Gibbons and Hovind (1999) of a dragon or dinosaur, from the Agawa Rock site in Lake Superior Provincial Park, Ottawa (Fig. 2c). It occurs together with several other petroglyphs, the recent meaning of which is known from the testimony of Anishinaabe informant Chingwauk, given to geographer and ethnographer Henry Schoolcraft in the early 19th century (Dewdney and Kidd 1967; Meurger and Gagnon 1988). The group of pictograms depicts a lake crossing by a war party, and the horned creature represents Underwater Panther, the mythological creature already mentioned above.

These examples would tend to speak against the presumption that dinosaurs and humans coexisted, as would, conversely, the testimony of all palaeontologists in the world. Moreover, contrary to popular belief, the palaeoart depiction of dinosaurs does not prove that the palaeoartists concerned actually saw such animals. Surprising as it may seem, we do have at least three presumably authentic depictions of dinosaurs in world rock art, all three quite probably created by the same San or Bantu-speaking artist. They were painted in black pigment at Mokhali Cave in Lesotho, southern Africa, apparently depicting an ornithopod extinct for more than 65 million years (Ellenberger et al. 2005). How is that possible? Together with them is a reddish rock painting of one of the many fossil sauropod tracks found nearby; Ellenberger, a rock art recorder and

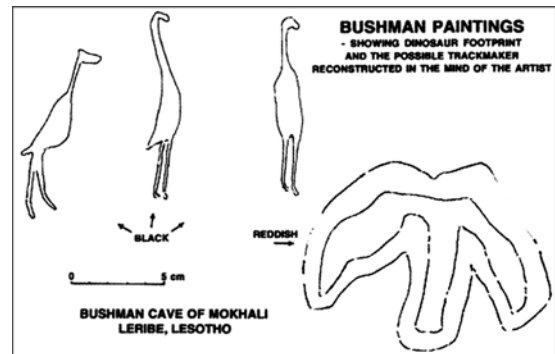


Figure 4. Three apparent reconstruction attempts of an ornithopod, based on fossil footprints, the likeness of one of which was also painted at the site Mokhali Cave, Lesotho (after Ellenberger et al. 2005).

ichnologist, has described some 58 rock slabs bearing such fossil footprints from the region, the nearest set of tracks being 3 km from Mokhali Cave. Moreover, there is a dinosaur skeleton preserved in the sandstone wall near the eastern end of Mokhali Cave. So the logical explanation is that the artist, who can be assumed to have been an expert tracker (as is very common among his/her people ethnographically), observed such fossilised tracks carefully and tried to deduce from them the kind of animal that would have made them. The palaeoartist's reconstruction of the ornithopod is superb: not only did s/he deduce from the tracks that the creature walked on two legs ending in birdlike feet, s/he also predicted a body shape that is rather close to reconstructions based on extensive skeletal material (Fig. 4). The deductive ability of this indigenous palaeontologist is utterly remarkable (cf. Lockley 1991, 1999). In fact his/her reconstructions of the ornithopod are clearly superior to those of palaeontologists of the calibre of Sir Richard Owen. Although Gideon Mantell had realised that many dinosaurs were bipedal, Owen insisted on them being quadrupedal (and placing *Iguanodon's* large thumb on its nose as a horn). The ethnoscience who left his/her reconstructions in Mokhali Cave outperformed him significantly.

Dinosaur tracks have also been depicted in a number of cases in rock art: in south-western Utah such a pictogram (Fig. 5) occurs in a shelter just below sets of fossil dinosaur footprints, at the Flag Point pictogram site in the Vermillion Cliffs area (Thybonny 2002; Lockley et al. 2006). One dinosaur track site in Utah is named *tsidii nabitin* by the Navajo ('bird tracks'), who believe the tracks are by Kwaatoko, the man-waterbird. Petroglyphs of sauropod tracks are also said to have been found in Arizona and Wyoming, in areas where fossil dinosaur tracks occur. In Algeria legends of a colossal bird relate to Cretaceous dinosaur tracks in that region; while in Australia, the legend of Marella, the emu-man, derives from theropod tracks on the



Figure 5. Rock painting of a large track at the pictogram panel of Flag Point site, Utah, showing (inset) one of nearby fossil sauropod tracks (photographs by Carol Patterson).



Figure 6. Track of *Megalosaurus broomensis* near Broome, north-western Australia, 37 cm long, interpreted by Aboriginal people as being of Marella.

Kimberley coast in the northwest of the continent (Fig. 6). According to Aboriginal beliefs, the nearby fossils of seed-ferns of the same period represent the feathers of the emu-man (Mayor and Sarjeant 2001). In Poland some petroglyphs occur next to a dinosaur footprint and have been suggested to have been prompted by the fossil track at the site Kontrewers, a place described as an ancient sacred site (Gierlinski and Kowalski 2006).

Since sauropods are thought to have become extinct about 65 Ma years ago (Archibald and Fastovsky 2004) and palaeoart is a purely Quaternary phenomenon their 'identifications' in rock art are apparently fantasy – but not necessarily always so. The issue of relevance here is that there is no logical difference between these delusional beliefs and the contentions, be they of Tertiary (Bednarik 2013a: Fig. 16) or Pleistocene rock art, on the basis purely of perceived iconography. The argument that the latter are plausible, and the others are not, is inadmissible. Plausibility may be seductive but has no scientific credibility, and is best guarded against more vigorously than implausible claims. Bearing in mind that there is very limited credible evidence of Pleistocene rock art known from the Americas (Bednarik 2014a) it is justified to demand impeccable and persuasive evidence from any proposal of faunal depictions of the Ice Age; *credibility* is not evidence.

Proboscideans

Dinosaurs are not the only extinct species averred to have been depicted in North American rock art. In contrast to the intuition prompting *creation-inspired assertions*, claims for the depiction of Pleistocene fauna are typically intertwined with contentions about the rock art's great antiquity. They tend to take the format of circular reasoning: the motifs are very old, therefore they might depict extinct fauna, and since the images seem to do just that, it proves their great age, which in

turn reinforces the identification.

Similar reasoning has been applied in many other parts of the world as well. In examining the Pleistocene megafauna claims from Australia we have argued that another reasoning sometimes fielded is that certain 'identifications' of zoomorphs are endorsed by zoologists or palaeontologists, and this has been used in North America also. It is a misleading argument because such specialists are trained to identify species or their remains; that imparts on them no innate understanding whatsoever of alien palaeoart imagery and of how the brains of the producer's contemporaries perceived diagnostic iconic details. Their opinions merely reflect the zoologists' own reality constructs, conditioning and training, which in the case of academic sophisticates are the basis of strong biases.

While in Australian rock art the incidence of Pleistocene faunal 'interpretations' is comparatively rare, and limited to the examples listed by Bednarik (2013a), they are considerably more common elsewhere. A case in point is the United States, from where only a representative sample can be offered here. For instance images of proboscideans have been frequently reported in the rock art and portable palaeoart of that country, usually with the implication that these and other purported megafaunal depictions infer a Pleistocene antiquity. The two proboscidean contenders (Haynes 1991) are the Colombian mammoth (*Mammuthus columbi*) and the American mastodon (*Mammut americanum*) (Fig. 7). The latter species measured in the order of 2.3 to 2.8 m at the shoulders (Woodman 2008) and was widely distributed in North and Central America (Polaco et al. 2001) until becoming extinct with the end of the Pleistocene, between 10 and 11 ka (thousand years) ago. The Columbian mammoth, standing at over 4 m at the shoulders appears to have occupied much the same area, but a dwarf sub-species



Figure 7. Reconstructions of the Columbian mammoth (left) and the American mastodon (right) (image adapted from Web sources).

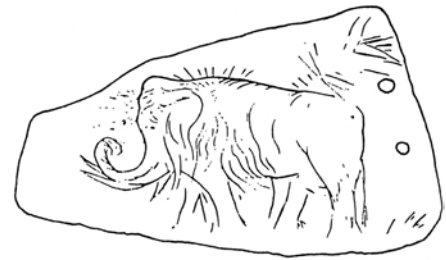


Figure 8. Proboscidean engraving on the whelk shell from Holly Oak, resembling a mastodon more than a mammoth (after Kraft and Thomas 1976).

existed on the Channel Islands, *Mammuthus exilis* (Agenbrood 1998, 2009). *M. columbi* is thought to have interbred with the woolly mammoth (*Mammuthus primigenius*) (Enk et al. 2011), so it may have been a subclade rather than a separate species. Although there have been reports of more recent finds these are doubtful, an extinction date of about 12500 BP is widely accepted and dates younger than 11 000 BP are not viewed as credible (Meltzer and Mead 1983; Haynes 1987, 1991; Fisher 1996; Fiedel 1999, 2009; Barnosky et al. 2004; Martin 2005; Waters and Stafford 2007; Haynes 2008; Faith and Surovell 2009; Surovell and Grund 2012; Louguet-Lefebvre 2013).

The naturalism of presumed depictions of elephantine zoomorphs in the United States varies considerably. For instance two petroglyphs at the Track Rocks site near Barnesville, Ohio, present *relatively* life-like representations, clearly forming discrete motifs, featuring what resemble trunks, tusks, full bodies, tails and legs, all consistent with anatomical details of elephants (see below). The proboscidean petroglyph of Rainbow Rocks, Pennsylvania, has an even higher number of iconographic variables seemingly confirming that identification (although still offering a majority of disconfirming elements, which most viewers tend to ignore in such pictures). Other such palaeoart imagery is considerably less detailed, presenting only doubtful proboscidean aspects. It may even comprise merely fortuitous combinations of several unrelated features that have been collectively interpreted as forming the image of a mammoth, as will be argued below.

The earliest recorded find of an American proboscidean 'palaeoart' image is the purported mastodon engraving on a pendant with two holes, made of whelk shell thought to have been found at Holly Oak, Delaware. Hilborne Cresson reported finding it in Late Pleistocene deposits in 1864 (Kraft and Thomas 1976) but presented it only much later, in 1889, after spending many years in France (Bahn and Vertut 1997: 79). The image (Fig. 8) is said to resemble the engraving on one of the earliest palaeoart plaques reported, from La Madeleine in the French Dordogne (Lartet and Christy 1864). The shell object was eventually radiocarbon-dated to about 1500 years BP (Griffin et al. 1988) and is believed to be a fake as it is much too recent to feature Pleistocene megafauna. Contrary to Bahn's (Bahn and Vertut 1997: 79) belief that its zoomorph depicts a

mammoth, if it is assumed to be anatomically reliable it would resemble a mastodon more closely, with its short legs, long body and relatively straight dorsal contour.

An elephant-like image in Yellow Rock Canyon, Nevada (Tuohy 1969; Clewlow and Uchitel 2005), has been proposed to have been made in the 1840s (Layton 1976), i.e. earlier than the Holly Oak fake. More recent than both is the claim by Hubbard (1927), the Curator of Archaeology who presented the dinosaur image from Havasupai Canyon as reported above, who also described, in close proximity to that motif, 'an elephant attacking a large man'. Within a few years, the petroglyph of a mastodon was reported by Gould (1935) from a site near Moab, Utah. Occurring on a deeply patinated cliff, it is in contrast to nearby petroglyphs practically unpatinated and clearly of recent vintage. Having been partially destroyed by vandalism in recent years, it has been suggested to depict a bear with a fish in its mouth, while others perceive in it the depiction of a circus elephant created in the early 20th century (Malotki and Weaver 2002: Pl. 200). This illustrates the reasoning of pareidolic identification: apart from the presence of what may be four legs there is hardly any indication that it is a zoomorph, and these legs seem to end in well separated, divergent toes. Then there are two red elephantine paintings at Birch Creek, Ferron, also in Utah. According to local residents, they and a series of 'deer', 'bison' and 'ibex' figures at another, nearby site were created in the 1950s by a named individual 'with the clear intention of misleading certain archaeologists' (Malotki and Weaver 2002: 192). The paintings do resemble two mammoths, but being relatively unprotected from the elements they are certainly not millennia old. Rock paintings so exposed have very short life spans (Trezise and Wright 1966; Donaldson 2012: 23–29).

A petroglyph at China Lake Naval Air Weapons Station presented as a possible proboscidean by Kaldenberg (2005) has also been refuted by Malotki and Wallace (2011) as pareidolic misidentifications, as has been another from Hieroglyphic Canyon, Arizona, and one more from near Suwanee, New Mexico. Malotki and Wallace also discredit the elephantine status of a 'mammoth' image at Manila, Utah (Thompson 1993), and the 'mastodon' at Craneman Hill near Mayer,



Figure 9. Elephantine petroglyph at Rainbow Rocks, Pennsylvania, presumed to be modern.

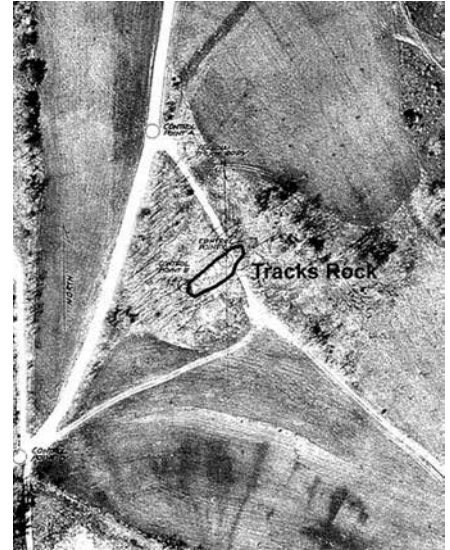


Figure 10. Aerial photograph of the reserve created around Track Rocks, Ohio (Web image).

Arizona. All of these images are thought to depict something other than proboscideans, and Malotki and Wallace (2011) correctly attribute these 'identifications' to pareidolia: their iconic properties are uniformly vague and interpretation as elephants would involve considerable susceptibility to autosuggestion. Urbaniak (2013a) presents a petroglyph from a site in Utah without naming the locality and pronounces it to be of a mammoth. The image does not resemble the characteristics of that animal and it is presented together with many other absurd claims (see below). This author goes on to purport that he has recorded other mammoth petroglyphs in Utah, but provides no details at all.

Much more convincing as depictions of elephantine creatures are the following several specimens. At Rainbow Rocks Petroglyphs Site, located east of Rockland Township in Venango county, Pennsylvania, occurs a zoomorph within a rectangle. It resembles an elephant reasonably well, featuring a raised trunk, large ear, tail and body shape approaching a naturalistic depiction (Fig. 9). The degree of weathering and growth of lichen implies a sub-recent date, and there is no attempt to adopt or copy the style of the nearby indigenous petroglyphs (Swauger 1971). Similarly, the positioning within the rectangular surround is evidently non-indigenous: indigenous North American rock art lacks such features. Most importantly no endeavour is evident to make the image resemble either a mastodon or a mammoth; therefore this should perhaps be regarded as having been produced for a different purpose other than faking. Much the same applies to another modern depiction of an elephant, a similarly detailed pecked outline from an unspecified site in New Mexico (Carol Patterson, pers. comm.).

The circumstances are less clear for the two proboscidean petroglyphs of Track Rocks (Swauger 1974). This rock art site is located west of Barnesville, eastern

Ohio, occupying the top of a hill and consisting of a cluster of sandstone outcrops and blocks (Fig. 10). Its existence was first reported by the son of the land owner, Robert G. Price, in 1856 (Caldwell 1880). The site became a popular recreational destination and in the 1880s a pavilion was erected for community dancing. The rock art is better preserved than would be expected in view of these developments, but during that time and subsequently, numerous inscriptions as well as new petroglyph motifs made with metal implements were added to the rocks. These are of importance because many are provided with dates, which are a welcome means of calibrating the effects of weathering processes on the site. The support rock is Waynesburg sandstone of the Washington Formation, Dunkard Group, a moderately consolidated siliceous sandstone of well-sorted finest sand fractions. Due to the relatively rapid granular exfoliation this is unsuitable for microerosion analysis and cement retreat measurement (Bednarik 2007a), but the taphonomic threshold of grain retention was determined by scanning several engraved dates microscopically for fractured grains. Impacted grains were completely absent in the inscription '1862', but occur amply in the less weathered adjacent date '5.1.1911'. On another rock, the inscription 'W.O.BLOWERS 8-18-1910' has a similar number of damaged grains, mostly of quartz, but the date '1891' features only very few. This established that the taphonomic threshold of retaining impacted grains lies between 1862 and 1880 CE. At most of these rocks the grains range from 170 μm to 300 μm in size (fine to medium sand fractions).

Of particular interest are two elephant-like petroglyphs that have been proposed to depict mastodons or Carthaginian period elephants (e.g. Moseley 1984; Bever and Moseley 1985), which anatomically do seem to resemble mastodons most closely (see Fig. 7). They



Figure 11. The Track Rocks site, showing the location of the two proboscidean petroglyphs. Cupules occur on the northern outcrops, but the other petroglyphs as well as the inscriptions are found on the blocks of the site's southern half (Web image).

are located on two blocks in the southern part of the complex (Fig. 11), within metres of about 113 presumed indigenously made petroglyphs (mostly human and other animal tracks, and a few zoomorphs; Swauger 1974). Proboscidean 1, to the west (Fig. 12), occurs on grains that are highly variable in both angularity and size, ranging from 150 μm to 550 μm , the larger grains being the most angular. Grain fractures were evident in the author's microscopic analysis, including with distinct stress marks, but all edges examined show no micro-wane development, and individual peck marks are clearly preserved as deep pits. Thus the petroglyph certainly postdates 1880 and is most likely of the early 20th century. Although it seems more recent than that, it must be considered that it has been coated with synthetic paints at least twice, including by black bituminous paint, i.e. it has been protected from weathering for periods of time. Depending on the durations of the paint cover the proboscidean image could be as old as 1910 or as recent as from the 1970s, as shown in Figure 13. One of the difficulties is that the elephant figures are not mentioned by those examining the site up to 1970 or 1971 (Whittlesey 1872; Read and Whittlesey 1877; Caldwell 1880; Mallery 1886, 1893; Howe 1897; Sheppard 1942), and Swauger (1974) reports that one of the rocks was missing at his visit. Others post-1985 failed to find one or both proboscideans, and it is best accepted as certain that both existed at Whittlesey's first visit (in 1884) and were then sufficiently weathered not to appear fresh.

The second 'mastodon' petroglyph, 8 m from the first, resembles the first closely, in style, execution and size, and it faces the same western direction, but offers a smaller number of fractured grains. At this location, most grains fall between 150 μm and 450 μm . Although it appears to be somewhat older, the figure's similar stylistic treatment suggests that it was executed by the

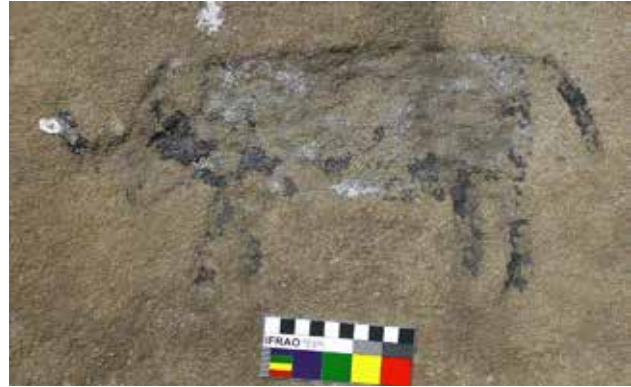


Figure 12. Proboscidean petroglyph 1, Track Rocks, Ohio, bearing exfoliating residues of black paint.

same hand.

The Pleistocene claim of a proboscidean engraving on a bone fragment from Florida appears to be considerably more credible, on the following basis. The 40-cm-long mineralised bone was collected at the Old Vero Site (Purdy et al. 2011), Vero Beach, by a fossil collector but the bone remains unidentified. It bears a small engraving resembling a mammoth (Fig. 14). As the precise provenience of the bone is not known, Purdy and colleagues subjected five samples to rare earth elements analysis: one from each of three strata, one from the incised bone, and a modern control sample. The results imply that the specimen may be from either stratum 2 (Melbourne Formation) or 3 (Van Valkenburg Formation) of the site, but the divergence in La, Ce, Pr and Nd is of concern and needs to be explained (Purdy et al. 2011: Fig. 2). However, the conforming heavy rare earth elements confirm the bone's fossil status according to Purdy et al. Concerning the more crucial question of the engraving's authenticity, they rely on such factors as uniform coloration across grooves and unmarked matrix surfaces (Purdy et al. 2011: Fig. 3), and the distinctive microscopic difference between the grooves forming the mammoth image and a replication made with a razor blade (Purdy et al. 2011: Fig. 4). The claimed absence of evidence for the use of a metal tool is not demonstrated, nor is it relevant. Obviously a forger would use a stone point, and if adequately astute would also provide the engraving with both an indication

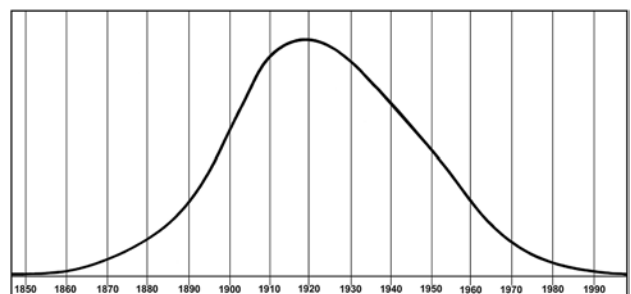


Figure 13. Probability curve defining the most likely age of proboscidean 1, based on the quantified occurrence of impact-fractured quartz grains in dated inscriptions.



Figure 14. The 'mammoth' engraving on an unidentified fossil bone from stratum 2 or 3, Old Vero Site, Vero Beach, Florida.

of weathering and artificial (non-polymer) patina. Such techniques have been employed at least since the Piltdown affair (Bednarik 2013b: 72–74), and the production of archaeological fakes is today a worldwide industry of sometimes great sophistication. In the case of the Vero Beach engraving, which is an isolated find lacking any archaeological context (except the controversial human remains reported by E. H. Sellards in 1916), stronger evidence for its proposed great age is required. Purdy et al.'s case rests on the continuity of mineralisation across the indentations (Purdy et al. 2011: 2911), and that this is demonstrated by scanning electron microscope backscattered imaging. This is hardly relevant, the fossil bone's state of mineralisation is no doubt uniform throughout its interior, and skillfully applied chemical or kinetic weathering could mask the newness of the grooves. Contrary to Purdy et al., they have not demonstrated (Purdy et al. 2011: 2911) that the mineralisation 'occurred across the indentations caused by the scribing'. More relevant techniques to gauge its antiquity were not applied, such as close attention to the temporal relationship between the engraved grooves and surface modifications of the bone by weathering, such as the countless longitudinal linear grooves; or the relative condition of the fracture edges of the bone, bearing in mind the obvious centrality of the image implying that it was created after the fragment attained its present shape.

All of this remains inconclusive but another line of argument favours the notion that the Vero Beach engraving is fake. Commenting on the similarity between it and Upper Palaeolithic cave art in Europe, Purdy et al. consider 'whether this similarity is simply due to coincidence or if there exists a more direct Ice Age connection between North America and Europe as Stanford and Bradley (2004) have argued'. A number of fairly similar mammoth images do occur in Europe, with some reservations, for instance in the galerie du Grand Plafond, frise de la Grande Fosse or frise des Cinq Mammouths in Rouffignac (Plassard 1999). However, the notion that the Clovis tool tradition derives from the Solutrean of Europe is extremely farfetched. Not

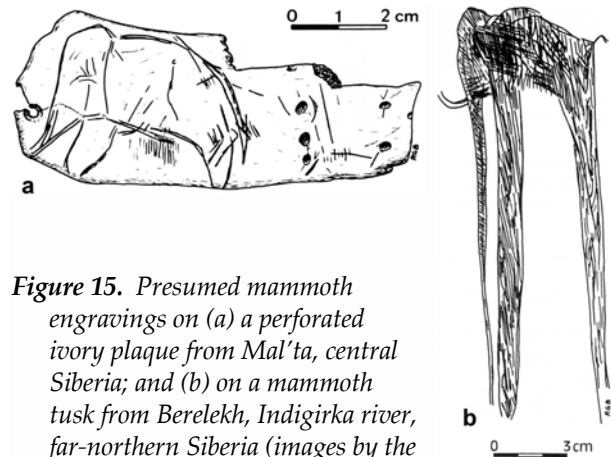


Figure 15. Presumed mammoth engravings on (a) a perforated ivory plaque from Mal'ta, central Siberia; and (b) on a mammoth tusk from Berelekh, Indigirka river, far-northern Siberia (images by the author unless stated otherwise).

only are the two separated by many millennia in time, but also spatially, by the Atlantic Ocean or vast expanses of ice. As Surovell (2014) notes, the genetics of Native Americans, whether mitochondrial or nuclear DNA, show strong links to Asia. This diffusionist idea involving the Solutrean derives no support whatsoever from what is currently known about Pleistocene maritime technology and colonisation ability (Bednarik 2014b) and in seeking the ancestors of the North American fluted point makers it seems rather more opportune to look towards eastern Asia. As it happens there are two presumed mammoth images of the Upper Palaeolithic available from Siberia (Bednarik 1994, 2013c) and they are much more relevant in the present context (Fig. 15). Neither bears much resemblance to the Vero Beach image, as a comparison of Figures 14 and 15 shows. Finally, it needs to be appreciated that, just as the producer of the Holly Oak fake portable palaeoart is thought to have found his inspiration in a French original, if the Florida specimen is a fake it would have been modelled on the same kind of Franco-Cantabrian source. Since it would be the only securely known figurative instance of Pleistocene palaeoart in North America (see below), much stronger evidence is required for its acceptance.

The 'mammoths' of Bluff, Utah

Nevertheless, the specimen from Florida represents the best-supported claim for an authentic American proboscidean palaeoart image. Designations of American petroglyphs as proboscideans have appeared from the 19th, throughout the 20th century and into the present. The Columbian mammoth and American mastodon were certainly both met by the early colonisers of the continent (Meltzer and Mead 1983; Fisher 1996; Fiedel 2009; Barnosky et al. 2004; Martin 2005; Faith and Surovell 2009), but none of the proposals of their depiction could so far be credibly substantiated. The most recent examples submitted include the two purported mammoth petroglyphs at the Upper Sand Island site near Bluff, Utah, presented in this journal (Malotki and Wallace 2011; cf. Malotki and Weaver 2002: 2). However, this was arrived at on the basis of only

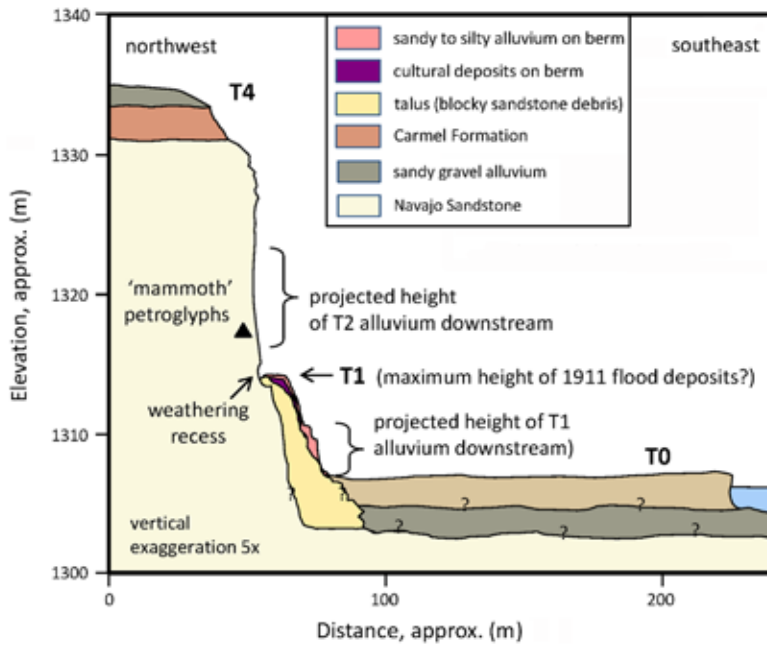


Figure 16. Schematic cross-section at Upper Sand Island (after Gillam and Wakeley, with permission).



Figure 17. Mass exfoliation of rock sheets as seen from the 'mammoth' panel, Upper Sand Island petroglyph complex.

cursory examination, because the rock art in question occurs at a height of almost 5 m above ground, on the vertical cliff formed by the San Juan River. Close examination was not possible until May 2013, when Ekkehart Malotki arranged the erection of a scaffold on the site, without which the findings presented here would not have been possible. They are based on three days of intensive microscopy of one of the two images as well as numerous other markings on the surrounding wall panel, both anthropogenic and natural.

The site is located in the eastern part of a long line of c. 20-m-high cliffs of Navajo Sandstone bearing several clusters of rock art, separated from the river by a flat recent floodplain or alluvial terrace postdating 1955 (Gillam and Wakeley 2013: Fig. 5c). It is this floodplain and several terrace residues that constitute 'Sand Island', which is in fact not an island at present. The surviving pockets of now largely eroded terraces along the foot of the cliffs record a history of past conditions. At the actual 'mammoth' site, a berm of a few metres height, comprising remnants of earlier alluvial covered by colluvial (angular blocks and rounded cobbles) fallen from the cliff, skirts its base, currently separated from the San Juan River by about 150 m of recent floodplain (Fig. 16). Concentrations of petroglyphs tend to be out of reach from that deposit today, and may be indicative of higher floor levels at the time of their creation. At various locations occur deep holes cut into the soft sandstone, implying the former presence of cliff dwellings that are most probably attributable to Puebloan people.

The Navajo Sandstone is poorly cemented, highly porous (its porosity ranges generally from 10% to 35%, and from 19% to 24% near the site) and of low compressive strength and moderate to high

permeability (Gillam and Wakeley 2013: 153). At the 'mammoth' site the cliff face continues to recede through erosion and laminar exfoliation of rock sheets (Fig. 17). Granulometrically the rock is dominated by the 200 μm to 300 μm fractions, with hardly any grains of >350 μm . This range is entirely unsuitable for microerosion analysis, which realistically demands greater than coarse sand fraction (preferably very coarse sand to pebbles). Most grains are quartz, among which very few of feldspar and several other minerals can be seen, and the cement is relatively weak and susceptible to deterioration. Therefore the rock decomposes readily if affected by moisture, and the factors of the rock's physical properties and responses exclude the possibility that the retreating cliff surface could be of the Pleistocene (Gillam and Wakeley 2013). Surface stabilisation by localised deposition of silica skins or ferromanganese accretions has only limited ability to retard erosion. The geological context of the petroglyphs clearly favours their late Holocene age.

This state is underscored by Gillam and Wakeley's (2013) study of terrace remains in the vicinity of the site. Two alluvial terraces of the Late Pleistocene occur on the plateau above the cliff, i.e. between 20 and 25 m above the river, and indicate the considerable fluctuations in river elevation during recent geological history. A third, T2, is well preserved c. 850 m downstream from the site, near the ranger station and up to 15–17 m above the river. A preliminary OSL date for this alluvium is approximately $18\,000 \pm 3400$ yr BP (USU-1158, 2 sigma; Gillam and Wakeley 2013); and Guido et al. (2007) have



Figure 18. One of the numerous vertical fissures of the 'mammoth' site that has given rise to the erosion of a petroglyph-like groove through moisture-caused granular exfoliation.

obtained a comparable ^{10}Be date of 19400 ± 1500 yr BP for a terrace further upstream. At that time, the 'mammoth' petroglyph support panel was



Figure 19. Anthropomorph of the Pueblo III tradition and linear grooves, probably dating from between 1100 and 1300 CE, executed on smoothed surface at a level below the purported mammoth figures.

concealed by this terrace deposit (Fig. 16). Towards the end of the Pleistocene, the river level fell below its present elevation, possibly exposing the basal sandstone 5–6 m below it, at which time the 'mammoth' panel could have been around 15 m above the river. Subsequent aggradation has resulted in terrace T1, which has yielded a preliminary OSL date of approximately 1200 ± 900 OSL yr BP (USU-1160, 2 sigma) downstream from the site (Gillam and Wakeley 2013). The top of this terrace matches the elevation of the berm height at the site, approximately 6–8 m above the river. This terrace was inundated during the historically recorded flood of 1911. Finally, the present floodplain, terrace T0, postdates all others and is between 1 m and 2 m above the present river, and historical records show that the regime of river channels remains highly volatile. In short, Gillam and Wakeley's (2013) work on the surviving terrace sediments implies that the petroglyph panels along Sand Island may have been generally inaccessible during the final Pleistocene, first covered by T2, and subsequently exposed high up on the cliff. They would have been most accessible before T1 was removed during the last millennium, which coincides with the probable Puebloan age of the abundant human occupation evidence at the site, including posthole recesses, wall remains, pottery and artefact scatters (stone implements made from river cobbles). The river's level or the history of terrace regimes of the remaining Holocene is not currently known.

Three forms of moisture contribute to the erosion of the cliffs, meteoric, interstitial and capillary. Meteoric water (rainwater and runoff) wash over the cliff face, depositing silt and clay fractions in 'terraced' formations. The numerous very fine vertical fissures and bedding planes convey interstitial moisture from within the sandstone strata which emerges on the cliff, creating grooves where prolonged moisture presence facilitates erosion of cement and granular exfoliation (Fig. 18). In some cases the emerging solution has led to the establishment of silica skins. The lower parts of the cliff, up to a height of about 3 or 4 m from the sediment floor, has been subjected to sometimes extensive disaggregation of the rock by capillary moisture rising up from the aquifer or sediment moisture.

The main focus of the investigation is the 'mammoth 1' (M1) arrangement and the numerous petroglyphs in its immediate vicinity (Malotki and Wallace 2011: Fig. 9), forming a horizontal band of several motifs and numerous others above and below it. Some of these appear to be zoomorphs, but none of them can be clearly identified as such, let alone at the genus or species level (Malotki and Wallace 2011: Fig. 7). The arrangement on the right of M1, 73 cm long, has been described as a 'bison', but it lacks unambiguous legs (they are anatomically incongruous) and its pareidolic 'identification' is untestable and irrelevant. Likewise, a series of similar 'blobs' to its left may or may not be zoomorphs, but there is scarce empirical evidence to support this. About 70 cm below M1 and to its left occurs a stylistically very distinctive anthropomorph, executed in typical 'hocker' or 'orant' attitude (Malotki and Wallace 2011: Fig. 11) (Fig. 19). It is safely attributable to the Puebloan period and possibly dates from around 1200 CE (Malotki, pers. comm.). Pueblo II and III people, dating from c. 850–1300 CE (Bostwick 2001: 428; cf. Malotki and Weaver 2002: Fig. 3), developed their characteristic cliff dwellings, the former presence of which is amply evident along the cliff. Before creating this motif, the maker

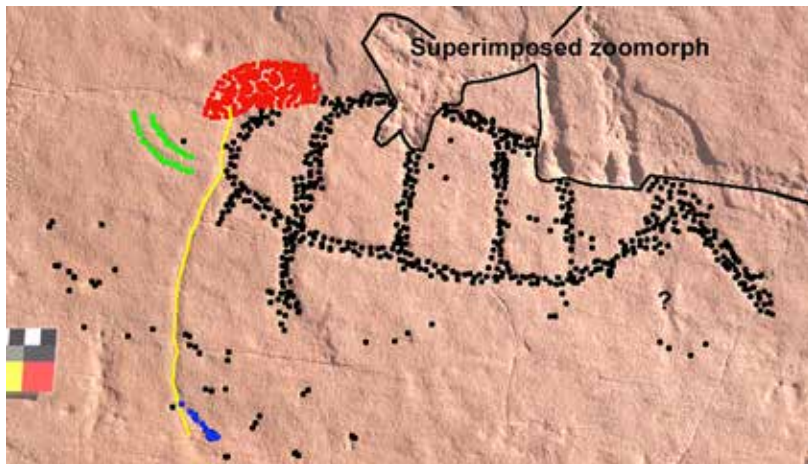


Figure 20. Deconstruction of 'mammoth 1', showing it to comprise (1) the amoeba-like outline with internal barring (black); (2) the natural groove (yellow); (3) the double arc (green); (4) the short line seen as 'bifurcation' (blue); and (5) the circle segment, the most recent component (red). The individual peck marks were recorded.

smoothed the rock surface by scraping it with a linear object to create a flat panel. Despite its relatively low age, the rapid granular erosion of the sandstone has already resulted in the formation of macro-wanes, and where the deep peck marks form an angle of close to 90° with the flattened panel, numerous measurements were taken by the author microscopically of the wane width (A), all falling between 0.5 mm and 1.0 mm and presenting a mean of 0.73 mm. This also applies to the abraded grooves immediately above the Puebloan anthropomorph and truncated by it.

In places where peck marks of the 'bison' figure above had formed steep enough angles with the panel to permit the measurement of comparable values, wane width are consistently about 3.0 mm. In view of the linearity of the metrical regression of wane width (and several other dimensions pertaining to it, namely r , x , z and h ; Bednarik 1992, 2007a: 130) according to the geometrical laws governing it, the 'bison' motif is in the order of 4.1 times as old as the Puebloan motif; therefore if the latter dated from 1100 CE, the former would be 3700 BP, if it dated from 1300 CE, the 'bison' would be 2870 BP. The 'bison' figure is superimposed on the main body of M1, but the two are of very similar antiquities, as shown by their respective weathering indices. Certainly the main body of M1 (the closed shape with four internal vertical bars) must be assumed to be well under 4000 years old.

However, the 'identification' of M1 as a mammoth image is based on a pareidolic effect caused by the constellation of several elements that are physically and temporally unrelated (Fig. 20). All of these five components occur several times on the same panel and within a few metres of M1. The 'top knot' (shown in red) is in fact a fully pecked circle segment, a motif also found nearby and unconnected to any other motif, and it is the youngest of the elements of M1,

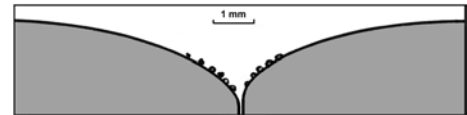


Figure 21. Cross-section through the groove interpreted as the 'trunk' of 'mammoth 1'; this profile shows that it was neither formed by abrasion nor by percussion, but follows a narrow rock fissure like that seen in Figure 18: depth of the groove increases exponentially as a function of closeness to fissure.

possibly postdating the main body by as much as one millennium. The double arc motif purported to depict the tusks (in green) also occurs elsewhere on the panel, and it is not connected to the groove pareidolically perceived as the front of the head and the trunk. The 'top

knot' also does not fit the mammoth interpretation, being horizontally displaced: it protrudes 19 mm past the 'front of the head'. Moreover, the vertical groove forming the 'forehead' and 'trunk' (in yellow) is not anthropogenic; it was formed by water-induced accelerated granular exfoliation occasioned by moisture seepage from a vertical rock fissure, as clearly shown by its cross-section and the complete absence of peck marks along its course (Fig. 21). Therefore the 'trunk', 'tusks' and 'top knot' are not part of the same motif, and without them there is no indication of a mammoth image.

There are other factors contradicting the proboscidean interpretation, such as the short oblique line pecked immediately to the right of the 'trunk' groove, omitted in Malotki and Wallace's (2011) recordings. It could be interpreted as a tail on the presumed zoomorph shown in black in Figure 20, the line to its right being its rear leg, and the potential head area above the foreleg, at the far right, would have been erased by the 'bison' motif. Irrespective of such unproductive speculations, the internal barring on this possible zoomorph is a graphic treatment characteristic of the Glen Canyon linear style (Turner 1963, 1971), which occurs frequently in the region's earliest rock art sequence (Glen Canyon is further downstream, at the confluence of the San Juan and Colorado Rivers, and the style extends from there to the Bluff region). It remains essentially undated, but at the Sand Island sites it predates the San Juan Basketmaker style by consistent superimposition and greater degree of weathering. One of the more credible and recent estimates (Cole 2009: 45) places the Glen Canyon linear style between 3000 and 400 BCE, and it is evident that the estimate proposed here for this particular motif, 3500 to 4000 years BP, falls right in the middle of that interval. It does, however, fall significantly short of the currently assumed extinction



Figure 22. The author conducting microscopy of 'mammoth 1' from scaffold at Upper Sand Island, May 2013 (photograph by Jean Clottes).

time of the Columbian mammoth, which is in the order of 10 to 13 ka BP (Faith and Surovell 2009; Louguet-Lefebvre 2013).

In view of the rapid disintegration of the Navajo Sandstone, especially at the base of the cliff, it is surprising that petroglyphs of possibly up to 4000 years age could survive as well as those at the Upper Sand Island sites did. This is evident from two dated inscriptions occurring between 12 m and 15 m west of the 'mammoth' panel, one reading 'VINCE 78', the other 'SKIP S 78'. Both already show cement retreat after a few decades. However, higher up sections of the cliff are coated by a thin silica skin accreted from solution seeping out from bedding planes and fissures. Upon entering the atmosphere's pressure regime, silica-rich solution has to relinquish much of its solute (pressure within the rock can be hundreds of times the atmospheric pressure) and the resultant, very thin accretion has to some degree managed to consolidate the surface of specific wall areas. About 15 m east of the 'mammoths' is a prominent panel of Glen Canyon linear figures high up on the cliff, some of which are darkly patinated, and this may have contributed to the survival of these petroglyphs. Microscopy has shown that the ferromanganese accretion covers mostly only

the receding cement, thereby retarding the surface solution process.

Very little can be said about the second 'mammoth' motif, M2, because it could not be effectively reached from the scaffold platform (Fig. 22) to conduct microscopy. This part of the panel lacks any silica skin and seems to be younger than M1 and the 'bison'. Again, there seems to be a confusing array of individual markings, but they are less well preserved and it will probably be difficult to separate the elements chronologically.

This and several other petroglyph panels along Upper Sand Island convey the impression that petroglyphs created by different traditions were made from different floor levels, resulting in vaguely defined horizontally arranged groups. Although by no means certain, it is very likely that this factor is related to fluctuating floor sediment levels that changed as the river altered its course and elevation with time. This impression is borne out by the observation that the groups, which occasionally extend over several metres horizontally, often seem stylistically consistent. If the site's sedimentation history of the second half of the Holocene were known, it would greatly assist in unravelling the chronology of the petroglyph sequence. Similarly, some petroglyph groups occur on what are thought to be 'sediment scars', i.e. cliff surfaces that were covered by terrace deposits, so the rock art has to postdate such sediments. Schaafsma (2013) has argued that there are also differences in patination related to relative elevation, suggesting that they are related to progressive lowering of sediment in the course of the Holocene. She has also expressed concerns about the mammoth interpretation, and in emphasising the often severely weathered state of Glen Canyon linear motifs she has asked the highly pertinent question, how could petroglyphs that must be at least nine millennia older have survived (Schaafsma 2013).

But there is another way to look at the issue. The Upper Sand Island claim for the depiction of Pleistocene fauna would be, with the possible but doubtful exception of the Vero Beach specimen, the only remaining such proposition from the Americas. More than that: the collective evidence from all continents except Antarctica is that the earliest palaeoart is always nonfigurative and of a quite specific range of typical motifs and graphic elements (Bednarik 1987, 1988). The same has so far applied to North America (Heizer and Baumhoff 1962; Grant 1967; Baumhoff 1980; Parkman 1992), and the only relatively credibly dated Pleistocene rock art currently known from North America confirms this scenario completely. The petroglyphs from Winnemucca Lake, Nevada (Benson et al. 2013), comprise cupules and complex reticulate and repetitive patterns of precisely the types previously associated with very early rock art, including in the Americas (Bednarik 1995, 2000). From this perspective, the Upper Sand Island claims are extraordinary, and they therefore necessitate extraordinary proof; that has not

been provided.

More claims of Pleistocene fauna in American rock art

The above shows that so far there have been at least eighteen reports of proboscidean images in the rock art and purported portable palaeoart of the United States, but none from Canada or Mexico, where both the mammoth and the mastodon also existed. With one possible and still unresolved exception (Vero Beach), these claims are not credible and the implication that extinct Pleistocene megafauna have been depicted in these images is without justification. Some may reflect attempts to depict modern elephants; others are fakes, and most are the result of pareidolia and wishful thinking. It is believed that the early human colonisers of North America would have seen both mammoths and mastodons, and many consider it likely that they contributed to the extinction of these and many other animals (Haynes 1966; Martin and Klein 1984; Fisher 1987; Saunders 1992; Agenbroad et al. 2005; but cf. Faith and Surovell 2009; Surovell and Grund 2012). It would therefore be perfectly possible that such creatures were depicted in the palaeoart productions of people of the final Pleistocene. However, the nature of the earliest surviving rock art of the continent renders this unlikely: just as the known Pleistocene palaeoart of Asia is almost entirely non-figurative (with just two exceptions; Bednarik 1994, 2013c), America's Asian immigrants seem to have brought with them no tradition favouring figurative depiction.

Of relevance here is also the 'Barnes tusk', even though it does not feature a proboscidean image, but it is said to be of mammoth ivory (Walker et al. 2010). Named after its discoverer, Jeb Barnes, it bears a series of apparently noniconic engravings (Fig. 23) and was reportedly found not far from the Legend Rock site in the Bighorn Basin of Wyoming. The 19.9-cm-long fragment bears reprecipitated carbonate accretions within engraved grooves (Walker et al. 2010). It probably managed to survive in the site's calcareous lithology. However, its true age remains unknown, as shown by Walker et al.'s (2010) research of the site, and it has been suggested to be from a Late Archaic context. Most importantly, analysis has demonstrated that it consists not of ivory, but is a shaped piece of travertine (pers. comm. Todd A. Surovell, 5 August 2014). Raman spectrometry has shown that it is of calcite, not apatite (as dentine is), but the pedogenic carbonate accretions in some of the engraved grooves indicate that it cannot be a fake.

Claims of the depiction of Pleistocene fauna in North America are not limited to proboscideans; they range from bovines to camelids, from horses to antelopes, and include even one rhinoceros. Bahn (1991: 92; cf. Bahn and Vertut 1997: 26) defines the proposition that the engraving of a rhinoceros on a bone from Jacob's Cave, Missouri (Messmacher 1981), is of the Pleistocene as 'less well authenticated'. This is a rather



Figure 23. Four views of a shaped piece of travertine bearing nonfigurative engravings, from Wyoming. Their age remains uncertain but they could conceivably date from the Late Archaic (adapted from Walker et al. 2010).

odd comment, considering that no Rhinocerotidae co-existed with humans in the Americas. *Teleoceras* lived in the Miocene and became extinct in the early Pliocene (Palmer 1999: 265), postdating the Eocene *Hyrachyus eximus* which did not remotely resemble any Pleistocene Rhinocerotidae. In fact most ancestral species of the family had succumbed to the middle Oligocene wave of extinctions (e.g. Prothero 1985). Therefore it can safely be assumed that the Jacob's Cave specimen is yet another fake.

Also of concern are the assertions of another archaeologist, David Whitley, that further extinct animal species have been depicted in American rock art. Among them is the proposition (Whitley 1996: 96) that an only partially patinated petroglyph at Legend Rock, Hot Springs County, Wyoming, depicts the extinct Western horse (*Equus occidentalis*). This Pleistocene species (Klide 1989) is thought to have become extinct around 11 ka BP, but the petroglyphs at this site are largely associated with the relatively recent Dinwoody style and only faintly patinated, and none are of extinct species (Walker et al. 2010). It is particularly disconcerting that this claim is intertwined with assertions about rock art dating that refer to endeavours to place Legend Rock petroglyphs at the Pleistocene-Holocene transition.

Another of Whitley's (1999) pareidolic assertions involving extinct fauna concerns the petroglyph of a quadruped (Malotki and Wallace 2011: Fig. 4) at Surprise Tank, near Barstow, California. This site is also dominated by weakly patinated motifs and claims about final Pleistocene rock art, as those made by Whitley, are without credible basis unless accompanied by analytical data clarifying antiquity (Bednarik 2007a: 115–152). Whitley (1999) describes a possible camelid image from the site, of *Camelops*, which roamed western North America from the late Pliocene until about 10 ka ago but may have survived into the early Holocene. Whitley has justified his 'identification' through a

'blind test' involving a palaeontologist (Whitley 2009: 102) who thought that this is what the petroglyph resembles. However, palaeontologists (or zoologists) are among the least qualified 'modern humans' to identify zoomorphs in rock art (Bednarik 2013a). They have undergone intensive intellectual conditioning to identify animal species or their remains within an empirical framework of understanding. They are less suitable to do so than people with less-conditioned perception, such as infants or illiterates. Academic training based on Western reality constructs cannot teach an understanding of the way indigenous rock artists perceive reality or the diagnostic iconic details of animals. This has less to do with cultural differences, and more with the operation of the brain and its perceptive processes (Bednarik 2013d).

Even more fantastic than Whitley's (1996, 1999) interpretations are those Ray Urbaniak (2013a, b, c, d) offers for a number of petroglyphs in Utah and Arizona, which become reminiscent of the propositions concerning dinosaurs and pterosaurs discussed above. They are, however, no more dubious than any others questioned in this paper: they are based on pareidolically informed readings. Indeed, it is the 'more plausible' claims that are the ones to be most apprehensive about, because their negation may squander more effort needlessly. Urbaniak's interpretations of American petroglyphs begin with his rejection of many quadruped images as depicting bighorn sheep, the usual explanation, and his proposal that they are images of roan antelopes (*Hippotragus equinus*), a species native to Africa (Urbaniak 2013b). However, he fails to consider how knowledge about this species could have travelled from Africa to Pleistocene North America, or why this explanation should involve a Pleistocene antiquity of the rock art in question. Urbaniak (2013c) presents a photograph of an unprovenanced petroglyph which he interprets as *Camelops*; or alternatively as *Aepyamelus*, a camel genus of the Miocene of much of the U.S.A. that became extinct 4.9 million years ago; or alternatively as *Deinotherium*, a proboscidean from parts of Eurasia and Africa that never existed in the Americas and survived only to the Early Pleistocene. In another petroglyph he sees a saiga antelope (*Saiga tatarica*), which became extinct in North America perhaps between 15 ka and 12 ka ago. Urbaniak (2013a) then reports that he has recorded a number of mammoth figures in Utah, but provides no further details, and only one photograph of a petroglyph not resembling that species. Finally, petroglyphs others identify as pronghorn antelopes (*Antilocapra americana*) Urbaniak (2013d) identifies as extinct forms of this animal.

The key issue here is not to ask why these images need to be of extinct versions when there is an extant kind, but it is to note that both interpretations lack a scientific (falsifiable or testable) basis. Both are equally untestable propositions. The fertile imagination of rock art interpreters provides no doubt a good deal of

information about how their visual centre and their perception work, and as such they may be of relevance to the psychologist or neuroscientist who has, for some reason, decided to study the brain and perception of rock art interpreters. Other than that, these speculations are of no interest to science, and most particularly not to the scientific study of rock art. This is irrespective of whether the 'interpretation' is plausible (e.g. of an extant species) or less plausible, as in the above cases. However, the implausible determinations are of value in demonstrating how unreliable plausible ones should be expected to be: plausibility can be illusory and often is.

Discussion

In comparison to Australia, where the number of purported rock art depictions of pre-Holocene animals has been relatively limited (Bednarik 2013a), their number in North America is considerably greater and it includes numerous downright absurd proposals and some fakes (there are no known fakes of 'Pleistocene' palaeoart from eastern Europe, Africa, Asia, Australia or South America). In view of the extensive rock art bodies of Mexico and Canada/Alaska (where final Pleistocene fauna in some cases survived longer), the complete absence of comparable claims from these regions is conspicuous. Their uneven distribution is also evident within the United States, with the highest concentration occurring in Utah and adjacent states. This factor seems too pronounced not to be diagnostic for the explanation of the pattern.

In Australia, all purported depictions of Pleistocene fauna or its tracks have been challenged (see Bednarik 2013a). In North America, much the same applies now: only the 'mammoth' engraving from Vero Beach has not been comprehensively refuted and still remains under consideration, and a few instances of depictions of fossil dinosaur tracks seem to occur. In Australia, a massive number of petroglyphs can safely be attributed to the Pleistocene, and they are without exception nonfigurative (Bednarik 2010). Indeed, this applies to the early part of the Holocene as well. In North America, end-Pleistocene rock art has been reported from Winnemucca Lake (Benson et al. 2013), it is also nonfigurative and it resembles many formal aspects of Pleistocene petroglyphs in Australia and elsewhere. The numerous engraved limestone plaques from the Clovis layer of the Gault Site in Texas, of which at least 134 specimens have come to light, feature only nonfigurative patterns (Collins 2002; Collins et al. 1991, 1992; Robertson 1999; for a broader discussion see Wernecke and Collins 2011), again consistent with the aniconic Pleistocene engravings elsewhere (Bednarik 2013c, 2014a). Their final Pleistocene authenticity is beyond question, which is not the case with the recently found 'Barnes tusk'. Nevertheless, even that palaeoart object features only nonfigurative engravings. Finally, it has been appreciated for several decades that the earliest form of rock art in North America consists of

cupules and linear markings (Heizer and Baumhoff 1962; Grant 1967: 26, 106, 131, 140, 152; Parkman 1992). Therefore, as I have proposed is the case in Australia, any conclusive evidence for figurative palaeoart of the Pleistocene remains lacking. Moreover, with only two exceptions the same applies in Asia, the presumed source region of the early colonisers of the Americas and Australia. In summary, any claim for figurative depiction in the Pleistocene of the Americas would contradict what is currently known; therefore it needs to present extraordinarily strong evidence. Opinions derived from pareidolia are not evidence at all.

This entire process of iconographic 'identification' is basically unscientific. To begin with, there is the neglect of the disconfirming elements of the motif, which typically account for the majority of the potential variables present. From the perspective of refutability they are the more important aspects of any figure, so to ignore them is imprudent. The tendency to experience some formal aspects of an image as naturalistic and others as poorly drawn also indicates the subjectivity of the process: on what basis would the beholder assess which aspects are naturalistic and which are not, without already anticipating the 'identification'? This is clearly a form of circular reasoning: the image seems to be one of species A, therefore those aspects that confirm this must be well depicted and thus diagnostic, while those that resemble species B or C are not. Then there are the effects of autosuggestion, which is involved in all pareidolia. It needs to be fully appreciated that the neural processes implicated in the 'identification' of rock art motifs are identical to those engaged in locating 'iconic' elements in random arrangements (rocks, cliff faces, clouds, tree bark, burnt toast etc.). Next, there is the subjective discrimination between motifs of 'identifiable' objects, and those that appear iconic but cannot be identified (e.g. 'fantastic creatures').

In all of this two issues are paramount: first, it needs to be remembered that the brain of the rock art producer was undoubtedly very different from that of the modern beholder (Helvenston 2013). Evolutionarily-derived, basic human perceptual abilities have not likely changed much in the past 50 ka or so; what has changed is how we think and what we think, as a result of the development of such technologies as writing that deeply affect how we perceive. Even today, the way visual or other neural data are processed within the brain varies greatly among people of different cultures. Secondly, only about 10% of visual information derives from the eyes; the rest comes from within the brain and essentially relates to past experience. Moreover, the visual input is far from reliable, as any magician or illusionist knows, and human vision with its subjective colour determination, optical illusions and so forth is hardly a reliable source of visual information. The point is illustrated by how rapidly the inferior posterior parietal lobule rewires itself in the rubber hand illusion (Botvinick and Cohen 1998; Tsakiris and Haggard 2005; Costantini and Haggard 2007; Marjolein et al. 2009).

This is a tangible demonstration of localised human neuroplasticity, and it is well known that ontogenic conditioning modifies both the chemistry and the structure of the brain (Maguire et al. 2000; Draganski et al. 2004; Smail 2007; Malafouris 2008). Thus the way the brain of a producer of rock art processed visual information can safely be assumed to have differed greatly from the way a modern literate Westerner perceives.

Therefore the creative pattern detection that constitutes rock art interpretation is effectively a projection of meaning onto marks on rock that, in reality, consist of pigment patches or anthropogenic surface depressions. This predisposition to 'abnormal meaningfulness' (Brugger 2001; Brugger and Mohr 2008) offers some comparisons with the Rorschach inkblot test. In both cases, the subject views graphic arrangements of marks, the meaning of which is not available but must be divined by examination. As implied by the Rorschach test, this process is subjective in that it is influenced by numerous factors, such as personality traits of the beholder and his/her life experiences. The comparison should, however, not be stretched too far because the marks rock art consists of are not random blots but have been made deliberately by human hand. Where the pareidolic reading of rock art fails is in the belief that one can communicate with the rock artist via the marks, particularly concerning intent: which visual clues are deliberate iconographic referents? The modern beholder's perception searches the rock art motif for details resonating with his/her visual system, in the same way as pareidolia operates. When it detects such elements, it locks onto them as if it knew that these are the clues the rock artist wanted to convey. As every experienced rock art researcher knows, practically all motifs in the world are non-naturalistic. Most comprise far more elements that contradict a favoured interpretation, but the instant an opinion of the meaning is formed, all disconfirming aspects are subconsciously suppressed. It is this tendency that most disallows such 'identifications' from scientific consideration, because in science the disconfirming evidence should be of particular weight. Therefore from the perspective of neuroscience, the notion that rock art connoisseurs can somehow conjure up the real (emic) meanings of rock art motifs from their brain's past experiences is simply preposterous (Bednarik 2011, 2012, 2013d, 2013e). The modern human brain has no relevant past experiences and no such ability should be presumed to exist.

Mindful of the fundamental inability of modern beholders to determine what is represented in rock art motifs, or to test such propositions, Australian researchers have long established the convention of placing all attempted identifications in quotation marks. This has been prompted in no small part by the only 'blind test' ever conducted of the ability of a modern sophisticate (a distinguished professor of anatomy) to correctly establish the nature of a large body of biomorphs. Macintosh (1977) determined that he had

misidentified 90% of a large corpus of rock art in two sites in the Northern Territory. Most of these motifs were considerably more detailed than most of those misidentified in the above examples as extinct North American megafauna — by commentators perhaps less qualified to identify biomorphs than Macintosh was. In the examples cited in this paper, not surprisingly the rate of misidentification was not 90%; it seems to have been 100%. The inherent demand to provide *extraordinarily strong evidence for extraordinary claims* has not been met.

Acknowledgments

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COMMENTS

The perils of pareidolic 'identification' of rock art images

By PATRICIA A. HELVENSTON

Robert Bednarik's paper, entitled *Pleistocene fauna depictions in American palaeoart*, is very seminal for three major reasons. **First**, he documents a deep interest in rock art depictions that are believed to portray extinct megafauna from the Pleistocene and assorted dinosaurs from the Mesozoic. This interest in fossil remains appears to be an innate human propensity to try to explain and make sense of their environment and there is recent evidence that it is an ancient practice. The evidence for this is introduced by Bednarik's discussion of the reports of Jacques Marquette and Louis Joliet of two frightening depictions of 'monsters' on a high cliff above the Mississippi River near Alton, Illinois, in 1763. The creatures were mythological and referred to as Piasa Birds by local Native American tribes. The Piasa Bird is believed to be based upon fossils of the pterosaur (*Rhamphorhynchus*), a great winged, flying lizard (228–66 million years ago).

Native Americans were aware of many Pleistocene fossils as well as dinosaur fossils and often constructed mythological tales of the giant creatures they imagined had once lived in a distant past. Adrienne Mayor (2005: 73–106) has researched the fossils and the related myths

of Native Americans from all over the Americas. She discusses the vast collections of giant fossils amassed by the Aztecs that amazed the Spanish when Cortez conquered their empire in Mexico in 1519 and describes legends of Quetzalcoatl, the giant feathered serpent of Mesoamerican mythology that was apparently based upon fossils in the Aztecs' possession.

Mayor (2000) proposes that the ancient mythological creature known as a Griffin to Scythians (a group of Iranian tribes living from the 7th century BCE on) and incorporated into Greek Mythology, was based upon desert nomads having seen fields of terrifying fossils in the Gobi desert of *Protoceratops*, a creature from the Cretaceous period (100–60 million years ago). Mayor documents the fact that many Pleistocene skeletons, as well as dinosaur remains, were considered great treasures by the Greeks and Romans and put on display in temples as they were believed to depict important mythological figures. The earliest artistic depiction of a fossil head identified as the skull of a large tertiary mammal, such as a giraffid, is found on a late Corinthian vase dated to 560–540 BCE (ibid. p. 160).

There are literally hundreds of examples of early civilisations 'making sense' of the numerous fossil bones they found in their environment. The bones were huge and convinced the observers that these animals were giants who were now extinct. Mayor's work demonstrates the enormous interest that people have evinced about fossils throughout the ages, most likely dating back to early *Homo sapiens*, who may have imagined what the animals looked like when they were alive and created myths about them.

A second reason for the seminal value of this paper is that depictions by Palaeo-Indians of Pleistocene megafauna now extinct, but which they may have been familiar with while still alive, have stirred the imaginations of people for centuries. Bednarik discusses these finds in detail, most of which are rock art depictions. He presents the painstaking modern scientific methods used to study them and concludes that with the exception of the mammoth engraving found at the Old Vero Site, most are either fakes or based upon pareidolic 'identification' which upon deeper scientific study, using many technical means of analysis, turns out to be incorrect. The perils of pareidolic 'identification' are particularly exemplified in the reports of Columbian mammoth petroglyphs found near Bluff, Utah. When Malotki and Wallace first reported these petroglyphs, dated to 13 000 to 11 000 years ago, their interpretation of them (2011: 143–153) created quite a stir in the rock art community and national press.

Bednarik's thorough and complex scientific analysis of these finds, made in part possible by the fact that Ekkehart Malotki erected a scaffold to enable scientists to study the petroglyphs which were some 5 metres above the ground, does not support the pareidolic 'identification' of these petroglyphs as mammoths. Bednarik describes other processes that contribute

to the pareidolic 'identification' of the large images, such as water seeping out of the vertical cliff face, or the fact that the overall mammoth image consists of other, more recent, non-related peck marks consisting of a circle segment which was misinterpreted as a cranial tuft. He presents in technical detail the geological history of the site and dates the marks from about 3500 to 4000 years ago. The scientific evidence amassed by Bednarik to refute the pareidolic 'identification' of the Bluff Columbian mammoths is very convincing and leaves little room for contestation. Thus, Bednarik has developed and modelled an effective methodology, consisting of extensive scientific study and technical analysis, to determine whether pareidolic 'identifications' are consistent with scientific data.

The third reason for the great importance of Bednarik's paper is his in-depth discussion of the perils of trying to interpret the meaning of rock art which was created by Palaeo-Indians who lived in an oral culture, thousands of years ago, that was completely different from our highly objectified, literate culture of the contemporary world (Helvenston 2013). Too many archaeologists and rock art specialists make the mistake of assuming that the brain of Palaeolithic or Neolithic peoples was similar to the modern, highly literate Western brain. But this is an incorrect assumption as the thoroughly modern brain only emerged in about 800 BCE when the Greeks began using writing extensively and it was incorporated throughout the culture.

The brain actually changes in the parietal area as children learn to read and write a language (Delhaene 2009). Walter Ong (1982 [1997]: 1) documented the differences between oral and literate cultures succinctly when he wrote that basic *differences* between the ways of managing knowledge and verbalisation in primary oral cultures (cultures with no knowledge of writing whatsoever) and in cultures deeply affected by the use of writing are profound. The results of such studies have been completely surprising, in that many of the features taken for granted in thought and expression in literature, philosophy and science are not directly native to human existence. Rather, they came into being because of the resources the technology of writing makes possible (see Helvenston *ibid.* for a detailed discussion of differences in oral and literate cultures).

In other words, the technology of writing has changed the human brain and consciousness. While the perceptual capacities of humans have not likely changed since the Lower Pleistocene or earlier, what has changed is written expression that directly affects our consciousness and how we perceive the world. Thus, Bednarik's discussion of the differences in perception of rock art between oral Palaeo-Indians and modern literate observers is crucial to our ability to 'guesstimate' the meaning of rock art. We can never fully understand the consciousness or perceptions of those early American hunters, some of whom pecked out rock art figures, so attributing contemporary understandings

to the ancient meanings of their rock art productions, without written records, is largely futile.

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RAR 32-1147

It's about time ...

By POLLY SCHAAFSMA

It's about time someone has taken the trouble to do a thorough review of the accumulating literature on claims — often outrageous — for depictions of extinct fauna in American Indian rock art, largely in the United States. In this essay Robert Bednarik conducts a skilful and painstaking dissection of the problems encountered in this corner of American rock art research. It is a laudable work. In it he argues against the extravagant claims for representations of Mesozoic fauna, i.e. dinosaurs. These are not only anomalies, but violations of what are known, well-established palaeontological facts. More problematic, and more difficult yet more plausible, is the issue of depictions of what appear to be of extinct Pleistocene animals, some of which we know were contemporary with people. He does not fail to remind his readers that 'plausibility can be illusory and often is'. Related to such identifications and among the good points for consideration discussed in this article is the fact that, in order to appear to give their questionable interpretations 'scientific' backing, consultations by rock art researchers with zoologists and palaeontologists inexperienced in dealing with rock art is a futile and often self-serving enterprise.

On the other hand, I take issue with the assertions that ' "identifications" of rock art imagery are always questionable', if in fact the reference here and elsewhere in the discussion is to *all* rock art imagery as seems to be the case. If I am misreading this, clarification is needed. In North America bighorn sheep, deer, elk, mountain lions, rabbits, raptors and fish are among animals that are clearly and commonly depicted. Further, moving on to his discussion section, how can we begin to argue about erroneous identifications, if the whole process of identification is, as he claims, 'unscientific' and thus impossible to prove? A paradox ensues.

That said, this article is timely and in many ways prompted by the recent publications on the incontestable incised image of a mammoth on fossil bone from somewhere near Vero Beach in Florida, as well as the simultaneous notoriety of the now widely published Upper Sand Island site in Bluff, Utah where two mammoths are said to be represented as petroglyphs (Malotki 2012; Malotki and Wallace 2010, 2011).

Although admittedly not qualified to evaluate the technical considerations involved pro or against the antiquity of the lines that define the Vero Beach mammoth, I certainly agree with Bednarik's final conclusion that the Vero Beach inscription is the only reasonable existing example of an authentic depiction of extinct Pleistocene fauna in the Americas.

Claims for representations of Pleistocene megafauna, he argues, can be discarded in nearly all cases on the basis of scientific inquiries, such as obtaining absolute dates on supporting media such as shell, or as in the Bluff case, determining that geological situation of a petroglyph renders the ancient dates proposed improbable, if not impossible. His discussion of interpretations based on pareidolic or Rorschach readings is pertinent in regard to the Bluff mammoths and in other cases and is well stated (for further commentary on the Bluff 'mammoths' see Schaafsma 2013). A questionable point, however, is the proposal that if early palaeoart exists at all in the Americas, that it will be non-iconic. Currently this is a popular presumption and not an established fact. Alice Tratebas (2004, 2006) has obtained dates from rock varnish covering petroglyphs of non-extinct cervids and animal tracks in Wyoming and South Dakota. While some of these dates place some figures in the late Pleistocene, Tratebas also acknowledges the potential unreliability of dates obtained from rock varnish. In this case, the problem is not image recognition but in the validity of the dating methods. The possibility of representational rock art from the end of the North American Pleistocene remains.

A review of Bednarik's bibliography reveals that many of the unsubstantiated claims for identifying extinct species (including dinosaurs) are published in North American periodicals with Creationist interests or other non-scientific agendas. In fact, an early article on Upper Sand Island (Malotki and Wallace 2010) is probably now something of an embarrassment to those authors, judging by their failure to cite it in their following publications on the topic. The journal in question, *Pleistocene Coalition News*, is, by its own admission on its website, a forum for challenging scientific research and the status quo. Further, Bednarik decries the lack of scientific acumen in several papers by Ray Urbaniak (2013a, b, c, d) in the same journal, that argue for the presence of a number of extinct species in Southwestern petroglyphs. These controversial publications are of interest only from the point of view of sociology and should be regarded as such.

As archaeologists and rock art researchers, it is imperative to reconstruct the past as seen through the window of ancient images, adhering to scientific principles to the best of our ability. Do we care that misinterpretations of the nature described here foster the fantasies of an uniformed public that thrives on sensational controversy? Is it socially unethical to turn our backs on these topics? While scholars are not obliged to challenge every misbegotten wild claim, there

comes a time when it is appropriate to call attention to these phenomena and the general issue. By reviewing the history of, the reasons for, and the results that follow fantasy projections and faulty identifications, Bednarik's article does just that. We are left only with the question of why there are no authenticated representations of extinct Pleistocene faunal on rocks in the Americas. Unlike the soft sandstone at Bluff with its illusory markings, there are countless contexts where Pleistocene petroglyphs of proboscideans might have endured, but so far, as Bednarik demonstrates, we have come up with nothing credible.

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RAR 32-1148

Wither Palaeo-Indian rock art?

By JASON R. THOMPSON

In Bednarik's interesting critical inquiry into alleged American instances of rock art he presents some very sound reasons to reject claims for Pleistocene examples thereof. Bednarik (p. 17) raises a fundamental point about many instances of ancient art by observing '... the fundamental inability of modern beholders to determine what is represented in rock art motifs, or to test such propositions ...'. Yet, there are other relevant proximate causes for the absence of reliably-identified Pleistocene examples of American rock or cave art that the tantalising paper fails to explore: widely differential intervals of human occupation, differential taxonomic diversity, comparative geography and differential demographic density. Since there are probably more documented examples of active Upper Pleistocene mammoth hunting in North America than in continental Europe, how should we explain the relative abundance of mammoth-themed or *all* art in Cantabrian Spain, the Dordogne region of France, and isolated examples elsewhere in France and Germany (Thompson 2011, 2014) in relation to its virtual absence in the Americas? Why did Upper Palaeolithic Europeans produce in general so many more art examples than Final Pleistocene Americans (Palaeo-Indians)?

Regardless of the wide diversity of opinions relating to when they were first occupied, the absolute chronological sequence of human occupations in the Americas is comparatively a brief blip in contrast to the much longer, much fuller sequence of continental Europe. The existence of pre-Clovis sites in North America (such as Meadowcroft rockshelter in Pennsylvania, earliest levels of which are age-estimated at ~14.5 ka), eastern Siberia (earliest age-estimates at

~35 ka), and Beringian Alaska (earliest age-estimates clustering at ~11.5 ka) suggests that whereas the peopling of the Americas was possibly not as rapid as previously constructed according to the 'Clovis-First' hypothesis (Neusius and Gross 2007: 114–115), the chronological sequence is nonetheless far shorter in both duration and time-depth than that in continental Europe, which spans the interval from at least one million years in southern Europe (Oms et al. 2000) to as early as 780 ka for Pleistocene Britain (Parfitt et al. 2010).

Regarding comparative human diversity in Pleistocene Europe and the Americas, it is important to note that only one human taxon migrated into the Americas, *Homo sapiens*, while perhaps as many as three if not four distinct but *interfertile* human genetic lineages coevally occupied adjoining areas of continental Europe, the Near East, Transcaucasus, eastern Europe, central Asia and Siberia during the Middle and Upper Pleistocene (Reich et al. 2010; Sankararaman et al. 2014; Vernot and Akey 2014). Recent (unfortunately as yet not peer-reviewed) reports of the Malaga, Spain cave paintings thought to have been made by Neanderthals (<http://www.dailymail.co.uk/sciencetech/article-2097869/The-oldest-work-art-42-000-year-old-paintings-seals-Spanish-cave.html>) suggest, moreover, that perhaps *multiple* of the European human taxa produced cave and rock art (see also Bednarik in too many cases to recount in citation, e.g. 2007b). It may therefore be that Upper Palaeolithic Europeans simply adapted and revised a pre-existing graphic tradition and turned it to their own ends as a means of asserting 'ownership' of places (caves) or a spatial sense of identity in graphic art, or other as yet insensible reasons. Such an interpretation would also square rather well with the documentation of shared similarities between terminal Middle Palaeolithic and Early Upper Palaeolithic lithic technology, settlement patterning and subsistence strategies (Blades 1999; Cachel et al. 1997; Churchill and Smith 2000; Enloe 1993).

The very different physical and cultural geographies of continental Europe and the Americas, and a wide variance in the respective Pleistocene demographic densities between them also likely bear on the matter at issue. In the Pleistocene Americas, two large continents entirely devoid of archaic human lineages were open for niche construction and economic exploitation by *H. sapiens*, a situation rather similar to Pleistocene Australia (Thompson 2011, 2014). In Pleistocene Europe, however, even sparse human populations were concentrated within a much smaller physical geography, across which multiple variable *cultural* geographies likely existed. In the Americas, demographic density did not increase, and development of distinct cultural geography was absent, until well into the Archaic period, after 8 ka (Neusius and Gross 2007), while increasing demographic density and some awareness of cultural geography is known to occur in continental Europe from as early as 40 ka ago, especially in permanently-

occupied Cantabrian Spain and Dordogne, just where and when a majority of Pleistocene parietal art occurs (Bocquet-Appel 2000; Bocquet-Appel et al. 2005).

Discussion

One thinks we can find sensible analogies for the development in what were unquestionably unique Palaeolithic artistic traditions for continental Europe in the development of Classical Greco-Roman and Medieval European traditions, for similar reasons. Classical culture was the result of cumulative development over millennia through the interaction of a wide variety of different cultures over time in the circumscribed Aegean world, including the Minoans, the Greeks, the Hittites, all manners of Sumerian, Akkadian and subsequent derivative Near Eastern traditions, Scythians, Celts etc. The archaeological, genetic, linguistic, historical and art-historical evidence suggests very clearly that within the circumscribed Aegean trading zone, genetic and cultural diversity and population growth led cumulatively, over time, to the artistic explosion of Classical Antiquity. A gradual, slow development of Medieval European art analogous to the Classical example also occurred across continental Europe for similar reasons: cultural diversity plus genetic diversity plus demographic growth over time inside a restricted geography can equal hybridisation of existing independent trends and development of new, distinct traditions.

The only periods in indigenous American artistic traditions that are even partially analogous to the Classical and Medieval examples above would be those of Mesoamerica and Andean Peru, both of which date well after their formative periods from about 3 ka to 1.8 ka, after which the now familiar interaction of cultural diversity and genetic diversity, with demographic increase over time, occurring within circumscribed physical geographies can be observed producing unique local traditions. In terms of artistic development, human events in the Americas were radically different from those of continental Europe and date much later in time, as do incipient human occupations. It would be foolish to assume that the much wider temporal, taxonomic and genetic diversity of Pleistocene Europe did not feature ramifications of *cultural* diversity as well. Thus it is possible to explain aspects of the difference between Pleistocene art in continental Europe and its absence in the Americas as functions of differential intervals of human occupation, differential taxonomic diversity, comparative geography and differential demographic density.

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RAR 32-1149

Pleistocene figurative art in the Americas: some cautions

By D. CLARK WERNECKE

It was with great interest that I read Robert Bednarik's paper on Pleistocene faunal art in the Americas and there is much in this paper that needed reiteration. I use that term because, and I mean no offense by this, much of this paper is a restatement of previous work done on pareidolia and dinosaur rock art. It is good to be reminded that our eyes can easily pick out what we want to see and that many claims should be checked and rechecked. I am not so sure we needed another primer on dinosaur depictions but I did find it interesting.

Turning to proboscidean depictions my interest peaked again. I do not think that this issue has been definitively dismissed as Bednarik seems to imply in his discussion. There have been other mammoth depictions recorded; for instance, on the Colorado Plateau by Agenbroad and Hesse (2004), that have not been closely examined (their sample included both Ferron and Sand Island). This article also mentions the Jacob's Cavern bone with the oft-repeated dismissal of the incised design as a rhinoceros. I would remind Robert that I sent him pictures of the bone which he had previously not seen and he replied that it 'looked like a mammoth or mastodon' (Bednarik, pers. comm. 2006). Unfortunately the artefact cannot presently be located for further scientific study. What caught my eye is the paired parallel zigzag on the artefact similar to that on the bone artefact recovered from the Aucilla River in Florida and on stones at Gault (Allison 1926; Hemmings 1999). It certainly is possible for someone to have faked this in 1921 but inclusion of the other designs consistent with a Pleistocene age makes this less likely — we cannot safely assume this is a fake. Just as it is valuable to be reminded of the tricks our eyes and minds can play on us it is also important to remember that the 'absence of evidence is not evidence of absence'. The remarkable finds in the Pleistocene archaeology of the New World in the last 20 years show us how quickly ideas can change with new finds.

The 'Barnes tusk' can be safely ignored — it is in fact travertine and not fossilised ivory (Surovell, pers. comm. 2014). I question the motives involved in the Vero Beach mammoth primarily because it has been recently sold privately. I agree that the argument regarding metal tools is odd and the manganese staining can be done in a bucket in about 10 days. What has bothered me has been the argument about art styles — if you look at images in Google using the words 'mammoth' and 'colouring' you will see numerous line drawings that are very similar, including one that differs only in the placement of a foot (that we have been using as an atlatl target for 15 years). Closer to my heart (and my research) is the comment on the limestone

(and chert) plaques found at the Gault Site in central Texas. We do, in fact, have two stones that I believe are representational, though of flora rather than fauna (Wernecke and Collins 2011).

Bednarik chastises researchers for circular reasoning but I find that some of his statements do not pass his own test. His contention that the Solutrean hypothesis is 'extremely farfetched' because of a time gap and the presence of the Atlantic Ocean is one. We do not currently have very good dates for the Solutrean, and older-than-Clovis finds in the Americas have pushed human presence back perhaps as much as 10,000 years. The Atlantic Ocean forms no more formidable a barrier than the Pacific Ocean, and new dates are making it very difficult for the first people to have walked to the New World. Hypotheses in science are for testing, not knee-jerk dismissal. Another example is the assertion that it is well established that the earliest art consists of 'cupules and linear markings', therefore Pleistocene art of any form is unlikely.

Is there evidence for pre-Holocene art in the Americas? Yes, but not very much at this time. There are many challenges including preservation, recognition and dating issues that I believe may be successfully addressed in the near future. I find it hard to believe that Pleistocene peoples in Asia (or even in Europe) and the first peoples in the Americas were very different and finds of figurative art including faunal art would not surprise me in the least.

I do agree that 'extraordinary claims demand extraordinary proof' though I have found that what constitutes proof in different researchers' minds differs widely. In a perfect scientific world a researcher would prove their point rather than try to prove others wrong. That said, and with the caveats above, I think Bednarik covered a lot of ground in depth and has given rock art researchers interested in the Pleistocene art of the Americas some marching orders.

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RAR 32-1150

Geological data suggest Holocene age for 'mammoth' petroglyphs at Sand Island, Utah

By MARY L. GILLAM

Introduction

These comments are limited to the geological context of the two petroglyphs at Sand Island in south-eastern

Utah that have been interpreted as images of living Columbian mammoths and therefore late Pleistocene in age (e.g. Malotki and Wallace 2011). These and several adjacent petroglyphs have also been described as 'elephant-like forms' or possible Pleistocene megafauna (Pachak 2012). Supporting arguments include reference to regional Clovis cultural and Pleistocene fossil sites, and other ideas circulating orally. Wide interest and controversy show that multi-disciplinary testing of all hypotheses is needed. Geological and weathering data, gathered at or near Sand Island (Gillam and Wakeley 2013; and Bednarik's present paper) suggest the petroglyphs are Holocene. These data show the need for further independent analyses.

Ongoing geological studies aim to estimate the age of the rock face supporting the Sand Island 'mammoth' panel, and to show whether the face could have stabilised before Columbian mammoths disappeared c. 12.5–13 cal ¹⁴C ka BP (Gillam and Wakeley 2013; Bednarik's paper; and references therein). In this summary, two lines of reasoning suggest a Holocene age for the rock face and petroglyphs. These are based on several roughly-dated episodes of river erosion along the cliff during late Pleistocene and Holocene time, and on age estimates derived from cliff shape and weathering.

The 'mammoth' petroglyphs are on a 20-m cliff of aeolian Navajo Sandstone that faces the San Juan River. At this panel, the cliff separates two alluvial terraces above it from the modern floodplain at its base. Three more intermediate terraces, within the height range of the cliff, are absent here but were identified from their closest known remnants 0.7 to 3.9 km away. Mounds of sandstone talus are present locally along the cliff's base.

Along large rivers in the Colorado Plateau, major terraces are thought to have formed as regionally continuous landforms resembling the modern floodplain (e.g. Pazzaglia 2013). Some terraces have been traced 100 km or more. This means that isolated terrace remnants at the same height can be reconstructed through moderate erosional gaps, and the three intermediate terraces must formerly have existed at the 'mammoth' panel.

Cycles of river and cliff erosion

At roughly 11 m above the river, the 'mammoth' petroglyphs are within the height range of alluvium associated with the highest intermediate terrace, T2, which is preserved 0.8 km downstream. Therefore the petroglyphs could not have existed until after T2 alluvium was eroded from the panel site (Fig. 16 in Bednarik's paper, from Gillam and Wakeley 2013). Dates for T2 alluvium (one revised SAR-type OSL, Utah Luminescence Laboratory 2013; and one new calibrated AMS radiocarbon, Beta Analytic Inc. 2013) place this erosional episode sometime after ca. 33–35 ka BP, or much earlier than the preliminary OSL date (Gillam and Wakeley 2013; date range based on overlap

of 2-sigma errors). However, a previously unrecognised terrace, examined 3.9 km downstream, projects to a height just above or below the 'mammoth' panel. A new OSL date for this alluvium shows that the river began to incise and remove this terrace sometime after c. 18–23 ka BP (rounded 2-sigma error range). The cliff probably retreated during and after terrace removal, so the rock face at the panel must be younger than this date. Coincidentally, the date is comparable to the preliminary OSL date for T2 (Gillam and Wakeley 2013), so it similarly brackets later events.

Because of the panel's location, the most critical period of river and cliff erosion is the latest. The panel lies within a large, roughly arch-shaped but very shallow recess in the cliff. A talus berm below this recess shows that it formed by rockfall after c. 18–23 ka BP but before the present floodplain was created. Existing dates, landforms and borehole data show that the river cut down after c. 18–23 ka BP to the alluvium-covered sandstone surface below T1 (the lowest of the three intermediate terraces, projecting below the 'mammoth' panel) and later aggraded to the top of T1. Concurrently, the river undercut parts of the cliff and made them collapse at slightly different times. Older, lower T1 alluvium is undated but may be several thousand years younger than c. 18–23 ka BP, if time is allowed for final sedimentation above the dated samples from the previous terrace and for later river incision to the sandstone below T1. One revised OSL date and early 20th-century flooding indicate that upper T1 alluvium is late Holocene to Historic. These constraints suggest that the rock face beneath the panel cannot have formed any earlier than several thousand years after c. 18–23 ka BP. More, now-unknown river-level fluctuations may also have occurred.

Cliff shape and weathering

The rock surface at the 'mammoth' panel is likely to be much younger than the unknown maximum age of T1 alluvium for several reasons. The recess is set into and therefore younger than adjacent cliff segments formed during the same river-erosion cycle. Also, its talus berm is well preserved in comparison to nearby talus remnants, indicating less time after talus accumulation for the river to erode the berm. Other features of the recess support a relatively recent age, such as its slight overhang, unusual and present because the recess has not yet broken upward through the top of the cliff, and angular edges between adjacent fracture faces, not yet rounded by grain removal.

Almost no differential erosion has occurred along softer rock layers in most places, surprisingly because the sandstone is weak and susceptible to rapid weathering (Gillam and Wakeley 2013; and Bednarik above). Yet some localised weathering, related erosion and alteration have occurred. For example, rising capillary moisture has caused cavernous weathering along the base of the recess. At and near the 'mammoth' panel, one finds minor loss of primary relief on fracture

faces, local scaling, shallow cracking, fine pitting and formation of surface coatings. In comparison with other cliff segments of varying ages, these features suggest a Holocene age for the rock face beneath the panel, perhaps somewhat older than petroglyph-age estimates based on macro-wanes as reported by Bednarik here.

In summary, available geological dates and age estimates based on weathering processes suggest a Holocene age for the panel's petroglyphs. Continuing studies may improve this analysis but direct, accurate dates for the petroglyphs and supporting rock face may never be obtained. That is why careful evaluation of all hypotheses, by multiple methods, is so important.

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REPLY

A baseline for megafauna depictions in American palaeoart

By ROBERT G. BEDNARIK

One of the several values the reader can derive from this debate is an appreciation of the great range of views among scholars about some quite specific aspects of rock art research. For instance Helvenston, as a neuropsychologist, fully supports my contention that the interpretation of rock art by cultural aliens is perilous, because of the great differences between the brains of the rock artist and the modern beholder. This point is of fundamental importance to all rock art researchers and they ignore it at their own peril. She also endorses the view that such interpretations arise from pareidolic perception, as indeed Malotki and Wallace (2011) had observed previously, in respect of a number of cases. Schaafsma, in sharp contrast, repudiates this position, and asserts that a wide variety of zoomorphs in North American rock art are *clearly* identifiable. She also perceives a paradox posed by the inability to 'argue about erroneous identifications' if the 'identification' process is impossible to prove. But I have made no attempt to prove or disprove any of these 'identifications'

on any iconographic basis; I would regard that as futile, and the 'paradox' is Schaafsma's creation. I have merely pointed out that empirical evidence has suggested that many such rock-markings cannot depict the megafauna species they have been claimed to represent, simply because at the time they were made, the species in question are thought to have long been extinct. These are fully testable claims. The perceived iconic properties of these motifs are not of great relevance to me. Since Schaafsma advocates 'adhering to scientific principles to the best of our ability', which such principles is she referring to? Any iconic interpretation amounts to an untestable proposition, so it is no more scientific than most archaeological claims — such as 'artefact X was found in layer Y'. These are claims from authority, which in science are inadmissible: science, after all, 'is the belief in the ignorance of experts' (Feynman 1968). Which raises the question: what is the basis of an outsider's claim that a zoomorph depicts a deer or an elk or whatever? It even lacks the pretense of authority; it is simply a statement about a person's perception. And it is certainly not testable.

This is not to say that the 'plausible' 'identifications' of zoomorphs are necessarily false; that is not the issue. Perhaps even most of them are correct, but when they are made by people who are not real experts on the meaning of rock art (these are generally indigenous people of comprehensive traditional knowledge about the rock art in question) they are made on the basis of the interpreter's own perception, and they involve the pretense of authority. They also involve appropriation through interpretation, which should be the prerogative of the cultural owners of the rock art. Such 'interpretations' could be construed as academic usurpation, objectification and cognitive colonialism, forming the very basis of the legitimacy of self-appointed 'rock art interpreters'. After all, the traditional owners of rock art would have every reason to object to these intrusions by Westerners, whose own construct of reality proper science *acknowledges* to be deficient. As a scientist I do not even know how my brain forms a construct of reality from the sensory information it receives (nor does anyone else), and to what degree that construct is a proper reflection of reality. Interpretation of exograms of people millennia ago is a pretty risky business for a brain that does not even understand itself.

Rather than these 'abstruse' issues, the main reasons for my concern are that interpretations by cultural aliens are unfalsifiable; and that the interpreters lack the neural capacity to 'read' the exograms of the rock artists as intended, because their brains differ significantly, as Helvenston emphasises. I also disagree with Wernecke's notion that researchers should 'prove their point rather than try to prove others wrong', because I think that a true scientist accepts that finite truth is not accessible to science, and that science is about refutation, not confirmation. In fact, I think that this stance of uncertainty is what sets science fundamentally apart

from other belief systems. So the scientist seeks to refute propositions, including his or her own. Wernecke even contradicts himself in his previous paragraph, when he states that hypotheses in science 'are for testing' (p. 22). And my definition of the Solutrean origin of the Clovis people was not a knee-jerk dismissal, as he writes; as the only researcher who has built eight vessels with stone tools and attempted sailing them on the seas (Bednarik 2003, 2014b) I have acquired a lot of relevant experience, and I have gone to the trouble of testing relevant hypotheses. Until Wernecke does the same and demonstrates, by experiment, that he can cross the Atlantic from France to Texas in a skin boat or similar contraption he built with Palaeolithic tools, his opinion on the matter is of no consequence. I certainly do not exclude the possibility that such a crossing did occur; I merely pointed out that, in view of much more opportune alternatives, this hypothesis seems *extremely* farfetched.

Thompson raises the interesting point of the European Final Pleistocene palaeoart traditions, with their substantial iconic component, compared with those of the rest of the world, which are either aniconic or contain almost no figurative elements. He shares Schaafsma's concern with the question why 'there are no authenticated representations of extinct Pleistocene faunal on rocks in the Americas'. There are various possible causes for this significant observation, and I have explored that topic in the past, in some detail. For instance all known Pleistocene rock art in Europe occurs in limestone caves, but no cave art of such age is known in the Americas. However, the Pleistocene cave art of Australia is entirely aniconic. So taphonomy may play a role, but it is not decisive. Combined with the obvious fact that there is ample evidence that European cave art is the work of youngsters, but no proof that it was made by adults (Bednarik 2008), and with the observation that in some extant cultures aniconic 'art' is considered 'more serious' or iconic is the preserve of children and teenagers (Bednarik and Sreenathan 2012), this points to a possible explanation. The most likely answer is simply that different societies in different world regions adopted different conventions of exogram production (Bednarik 2014c).

I thank Helvenston particularly for her considerable broadening of my proposal that traditional indigenous peoples have made great efforts to explain the fossils they encountered in the natural world. Many authors have a tendency to underestimate the abilities and efforts of the ancients to make sense of their world, yet when one looks closely there are numerous forms of evidence suggesting that they observed the natural world very closely, and they sought to find explanations for the mysteries they observed.

In spite of the notable differences between some of the comments made and my own views, the reader will have also noticed that, on the actual topic of my paper, the potential depiction of megafauna in American palaeoart, all commentators are in agreement with me.

All concur that none of the claims so far examined has stood up to scientific testing. Wernicke does mention a few further 'mammoth' depictions that have not so far been analysed, but he is clearly sceptical of the Vero Beach engraving, for the same reasons as I am. Purdy et al.'s (2011) findings have not convinced him any more than they have swayed me. There are the murky circumstances of its discovery, its recent sale, the lack of a secure provenance, the ease of creating such a fake, and the neglect of key attributes of the object in the Purdy et al. paper. Wernicke believes to see two images of flora among the hundreds of limestone *and chert* plaques from the Gault Site. Perhaps these represent the only figurative palaeoart from the American Pleistocene, but I would like to point out — at the risk of it being seen as knee-jerk dismissal — that I think if I made thousands of linear marks blindfolded, a few might resemble plants. Or, if we issued a chimp with a keyboard it would in the course of a billion years probably succeed in writing a sonnet. We even have one example of random rock marks forming what some see as a mammoth image, with a little help from pareidolia.

The need for 'another primer on dinosaur depictions' Wernecke questions arises 'because the notion of the depiction of Mesozoic fauna is logically no different from that of Pleistocene fauna: in both cases it is based on pareidolic "identification" and in both cases it leads to the derivative hypothesis that humans depicted these animals' (pp. 3–4). I have also implied that plausibility is not relevant, and to illustrate this I chose to contrast the Pleistocene claims with Mesozoic ones; I prefer the latter, they are less fervently defended by the 'believers'.

Gillam adds valuable new geological information to the discussion of the Sand Island 'mammoths', including new terrace dating results. Of particular importance are her concluding observations: the petroglyph panel 'is likely to be much younger than the unknown maximum age of T1 alluvium'; the relatively well preserved condition of the talus berm below it; and the structural recentness of the concavity in the cliff that contains the 'mammoth' panel. These and other factors add significantly to the indications of a relatively recent antiquity of the petroglyphs, and they also point towards the direction of future research of the site and its context.

Have I missed anything? Well, there are Tratebas' dating attempts, but I have dealt adequately (Bednarik 2007a) with the methodology of securing dates from rock varnish, which has been abandoned by its originator almost two decades ago. The bottom line, as Wernicke observes, is that my paper provides a baseline for future research into the Pleistocene rock art of the Americas: so far, no credible depictions of megafauna have been presented.

I thank all commentators most cordially for having considered my observations and for having responded constructively.

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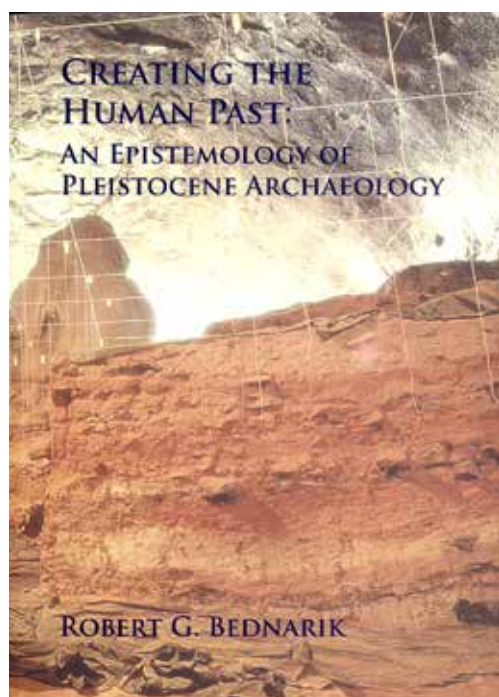
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