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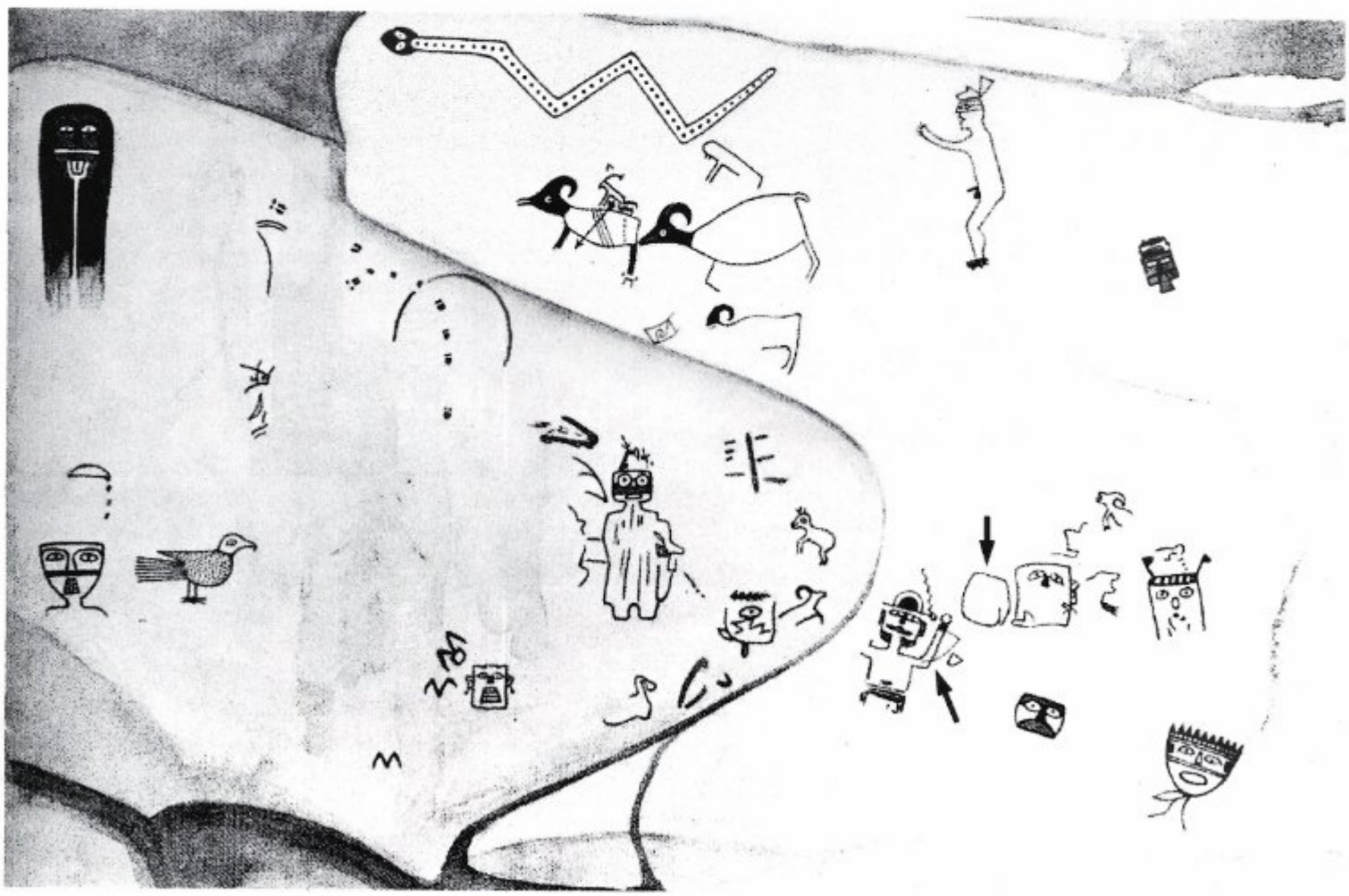

Hueco Tanks, Texas, U.S.A., site 23. The squared circle and anthropomorphous figure with an upraised left arm indicated by arrows have been sampled for dating analysis (after Kirkland and Newcomb 1967: Pl. 144). (Figure 9, article by M. Hyman et al., see page 82.)

The journal *Rock Art Research* is devoted to developing theory and methodology for the systematic and rigorous understanding of palaeoart and related phenomena. Emphasis is given to communication across the various disciplines related to the study of global rock art, and to synthesising related subjects around the journal's focus: the surviving externalisations of early world views.

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Melbourne, Australia

November 1999

The principal objectives of the Australian Rock Art Research Association are to provide a forum for the dissemination of research findings; to promote Aboriginal custodianship of sites externalising traditional Australian culture; to co-ordinate studies concerning the significance, distribution and conservation of rock art, both nationally and with individuals and organisations abroad; and to generally promote awareness and appreciation of Australia's prehistoric cultural heritage.

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Major papers are abstracted by international abstracting services.

KEYWORDS: *Rock painting - Radiocarbon dating - Jornada Mogollon - Texas - U.S.A.*

RADIOCARBON ANALYSES OF ROCK PAINTINGS: HUECO TANKS, TEXAS

Marian Hyman, Kay Sutherland, Marvin W. Rowe,
Ruth Ann Armitage and John R. Southon

Abstract. Thousands of paintings are on the walls and ceilings of rockshelters in the three granite outcrops east of El Paso, Texas, known as Hueco Tanks. Analyses of seven paintings reveal a range of radiocarbon dates from 1350 BP to 740 BP. The paintings belong to the Jornada Style of the Mogollon region, which includes solid and outline 'masks', 'stepped pyramids', 'horned serpents', goggle-eyed figures, 'birds' and 'dancers with headdresses'.

Introduction

Hueco Tanks, 50 kilometres east of El Paso, is near the physical centre of the Jornada Mogollon region, an area bordered on the west by the crest of the Black Range of New Mexico, on the east by the Guadalupe Mountains of Texas, and reaching from Carrizozo, New Mexico, in the north to below Villa Ahumada, Mexico, and Sierra Blanca, Texas, in the south (Figure 1). The 'huecos' or hollows are the result of erosion of an anomalous outcrop of igneous rock rising several hundred feet above the Chihuahua desert.

The paintings at Hueco Tanks were first recorded systematically by Forrest Kirkland (Kirkland 1940). Many are shown in detail in Kirkland and Newcomb, *The rock art of Texas Indians* (1967), reissued in 1996. The area was re-surveyed by the El Paso Archaeological Society (Toness and Hill 1972; Davis and Toness 1974). Their more recent discoveries have substantially increased knowledge of the painting inventory. Several thousand rock paintings are on the walls of approximately 50 of the rockshelters at Hueco Tanks. As the only permanent source of water in the vicinity, the outcrop attracted people of many different cultures over time. At least three styles of painting are evident: Desert Archaic, Jornada Mogollon and post-European contact.

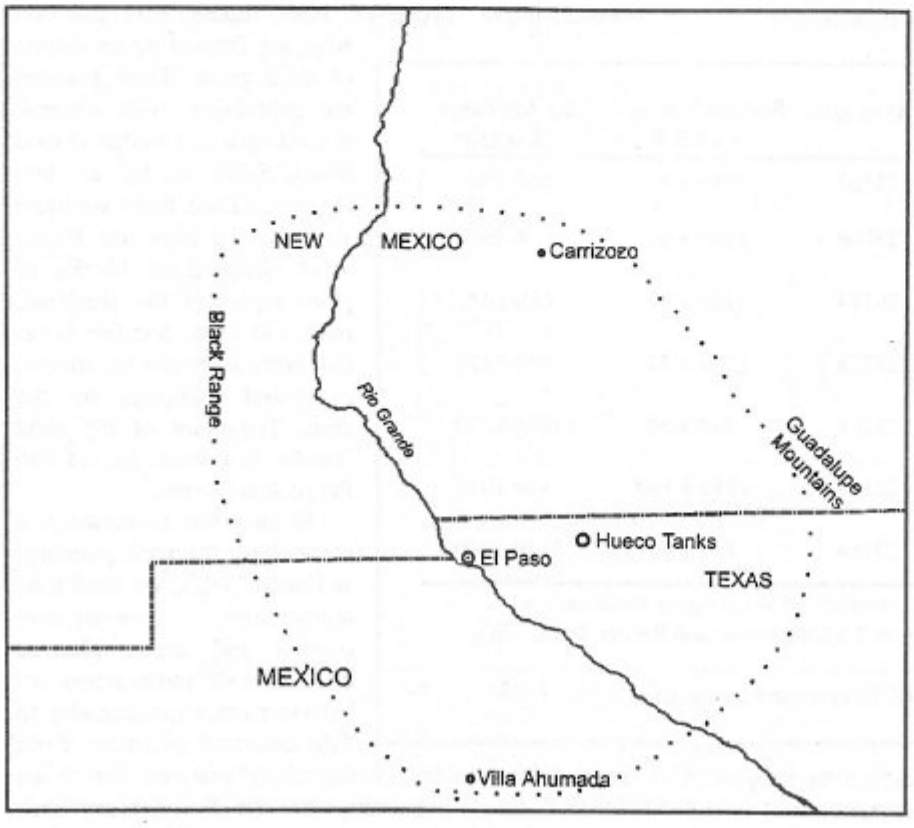

Figure 1. *Map of the Jornada Mogollon region indicating Hueco Tanks.*

Sample: figure	TAMU ID	Reaction time (min)	RF power (watts)	Carbon (µg)
12A-1: indeterminate squared motif, charcoal	3T195	60	150	300
20C-1: goggle-eyed motif, charcoal	3T212	67	150	120
20G-1: goggle-eyed motif, charcoal	3T161	176	100	180
20G-2: goggle-eyed motif, white pigment	not saved	120	100	20*
20G-3: goggle-eyed motif, charcoal	3T202	60	150	50*
20G-4: goggle-eyed motif, charcoal	3T208	60	150	40*
20G-5: goggle-eyed motif, charcoal	3T227	90	100	140
20K-1: black (charcoal) and yellow goggle-eyed motif	3T214	60	150	370
20K-2-1: mask, charcoal	3T217	60	150	170
20K-3: sheep, charcoal	3T224	90	100	20*
20K-4: anthropomorph, charcoal	3T225	90	100	20*
23C-1: squared circle, charcoal	3T191	60	150	460
23C-2: upraised arm, charcoal	3T193	60	150	180†
24F-1: seven centrally radiating lines, charcoal	3T194	60	150	70
28A-1, streak, charcoal	3T190	60	150	420

*Insufficient carbon to accurately analyze radiocarbon.
†Lost at the Center For Accelerator Mass Spectrometry, Lawrence Livermore National Laboratory.

Table 1. *Sample identifications and oxygen plasma conditions for Hueco Tanks rock paintings.*

Sample: figure	CAMS ID#	Radiocarbon age, years B.P.	2σ Age range (cal A.D.)*
12A-1: indeterminate squared motif	23560	1250 ± 60	660-980
20C-1: goggled-eyed motif	25886	1250 ± 80	650-990
20G-5: goggled-eyed motif	29314	1180 ± 80	660-1020
20K-2-1: mask	27228	1010 ± 70	890-1210
23C-1: squared circle	23165	740 ± 50	1210-1390
24F-1: seven centrally radiating lines	23559	1350 ± 160	410-1020
28A-1: streak	23164	790 ± 60	1070-1300

*Calibrations obtained with the University of Washington Radiocarbon Calibration Program CALIB version 3.0.3A (Stuiver and Reimer 1993) using Method A.
The dates have not been corrected for isotopic fractionation.

Table 2. *Results of radiocarbon analyses for samples with sufficient carbon for reliable data.*

The majority of the paintings at Hueco Tanks are Jornada Mogollon. Paintings and more commonly petroglyphs of this style are found throughout the Jornada Mogollon region (Schaafsma 1992: 61). The colours used at Hueco Tanks are red, black, white, yellow, brown, grey, blue and green (Kirkland 1940). The motifs include geometric designs such as zigzags, stars, 'stepped pyramids', other sharply angled designs, nested semicircles, combs; long tailed 'birds', 'turtles', 'serpents', 'mountain sheep', 'deer' and other mammals; anthropomorphs with headdresses; 24 rectangular, armless, legless composite figures with mask-like goggle-eyed heads; and over 250 painted 'masks', about the size of a human face. This is the largest collection of painted 'masks' in North America. These often flat-headed 'masks' are either outline or solid (Kirkland 1940; Toness and Hill 1972; Davis and Toness 1974; Sutherland 1975, 1976, 1977). In the former, pupils, eyebrows, nose, mouth, ears and earrings are framed by an outline of thick paint. Their features are expressive, with almond-shaped eyes and wedge-shaped noses. Solid 'masks' are less common. Their faces are more abstract: the eyes are blank; solid sharp-edged blocks of paint represent the forehead, nose and chin. Smaller negative areas represent the mouth, eyes and markings on the chin. The paint of the solid 'masks' is a wash, soaked into the rock substrate.

In an effort to establish a chronology for rock paintings at Hueco Tanks, we used low-temperature, low-pressure oxygen and argon plasmas coupled with radiocarbon accelerator mass spectrometry to date charcoal pigments from these paintings. Our radiocarbon analyses for seven Hueco Tank rock paintings are the first for any rock

painting in the Jornada Mogollon region. The numerical age estimates range from 1350 ± 160 BP to 740 ± 50 BP (see Table 1 for sample identification, Table 2 for calibrated date ranges, Figure 2 for a graphical illustration of the calibrated A.D. dates and Figure 3 for a graphical illustration of the uncalibrated A.D. dates).

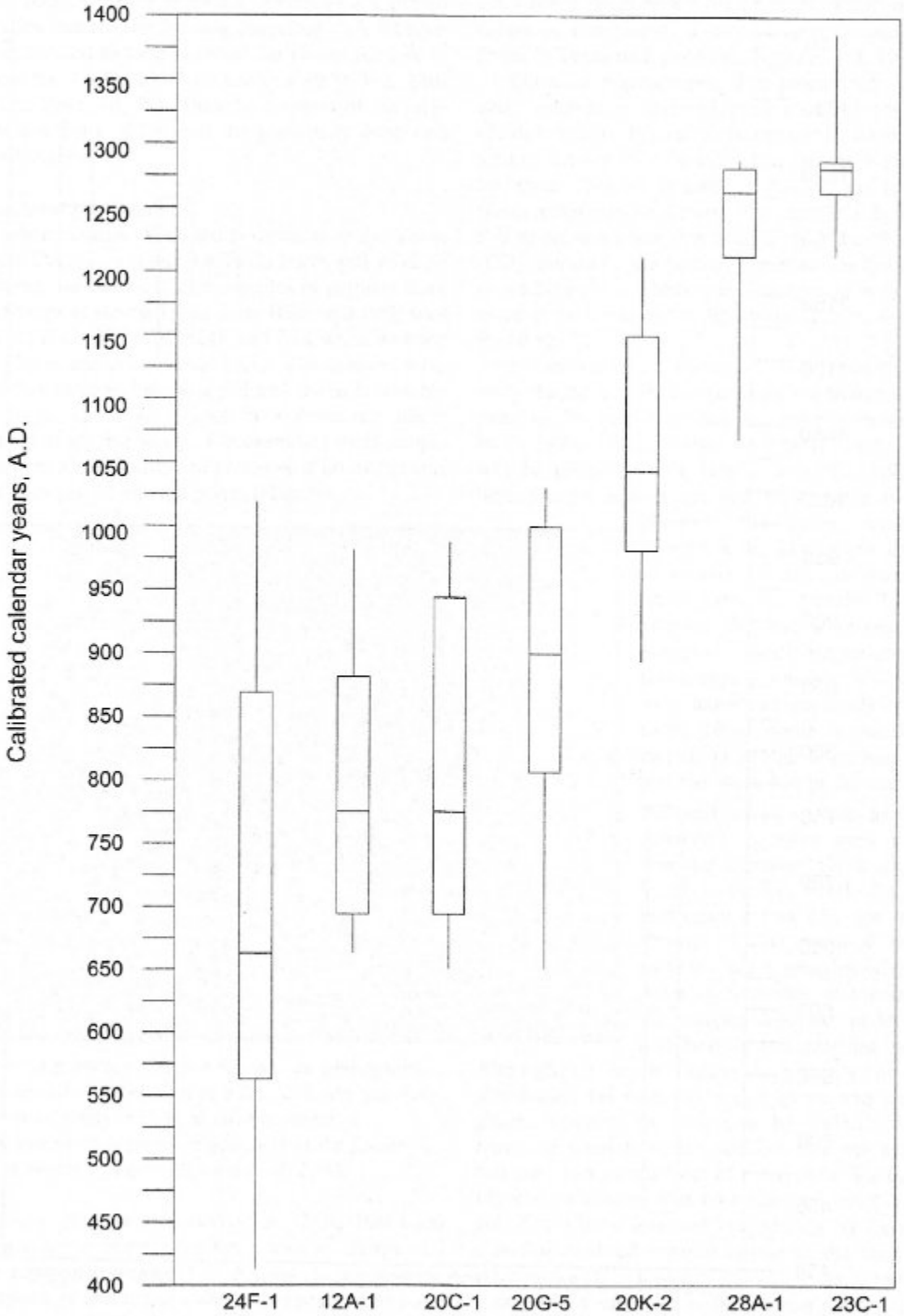

Figure 2. A plot of seven calibrated A.D. dates based on our radiocarbon determinations arranged chronologically. The labels on the horizontal axis are sample numbers. The rectangles represent 1σ ranges; the vertical lines above and below represent 2σ ranges. The horizontal line in each rectangle represents the mean. Four of the dates are older than had been anticipated. None of the dates have been corrected for isotopic fractionation.

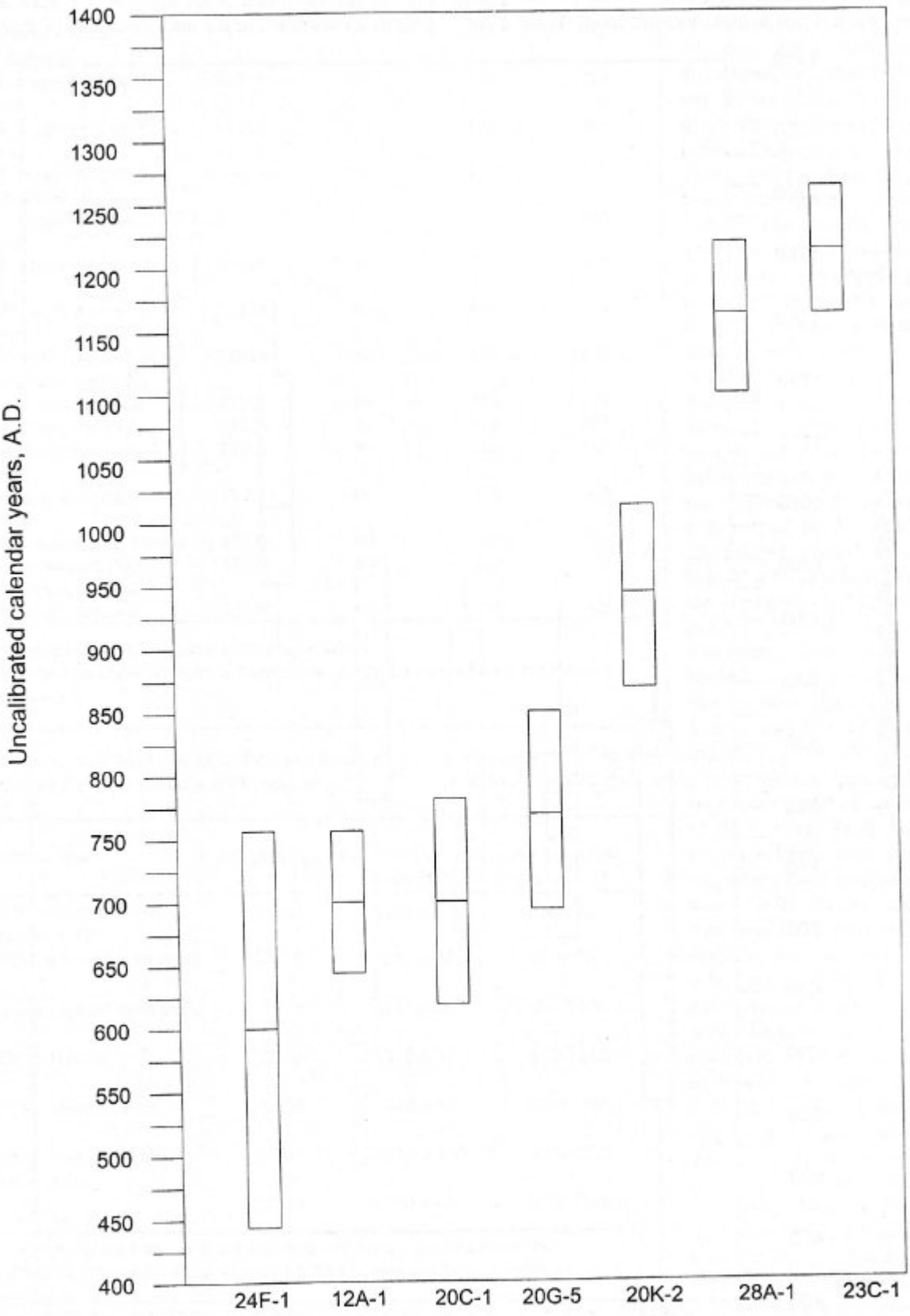

Figure 3. A plot of seven uncalibrated A.D. dates (i.e., 1950-radiocarbon date, BP) arranged chronologically. The rectangles represent 1σ ranges; the vertical lines above and below represent 2σ ranges. The labels on the horizontal axis are sample numbers. Four of these dates are well before the expected ages of the paintings of uncalibrated A.D. 1000 or more recent. None of the dates have been corrected for isotopic fractionation.

In this paper we calibrate all radiocarbon (BP) dates cited, whether from references or our current work. The 'A.D. dates' often given in earlier papers, apparently referring to 1950 minus an uncalibrated radiocarbon date, are taken verbatim from the references and placed in quotation marks. The Jornada Mogollon rock art style is frequently said to have replaced the Desert Archaic at approximately 'A.D. 1000' (Schaafsma 1980: Fig. 140; Schaafsma 1992: 60, 71). Thus the majority of the samples we dated are older than the previously suggested ages for the style.

Experimental procedure

Sample collection. With the permission of the Texas Historical Commission and the Texas Parks and Wildlife Department, we removed microsamples of pigment from rock paintings at Hueco Tanks State Historical Park sites 12A, 20C, 20G, 20K, 23C, 24F and 28A while wearing rubber gloves and using dental picks. The samples were placed on aluminium foil, wrapped and stored in sealable plastic bags. These were kept in a desiccator under argon until ready for study. We examined each sample with an optical microscope to ensure that no extraneous material was placed into the plasma chamber.

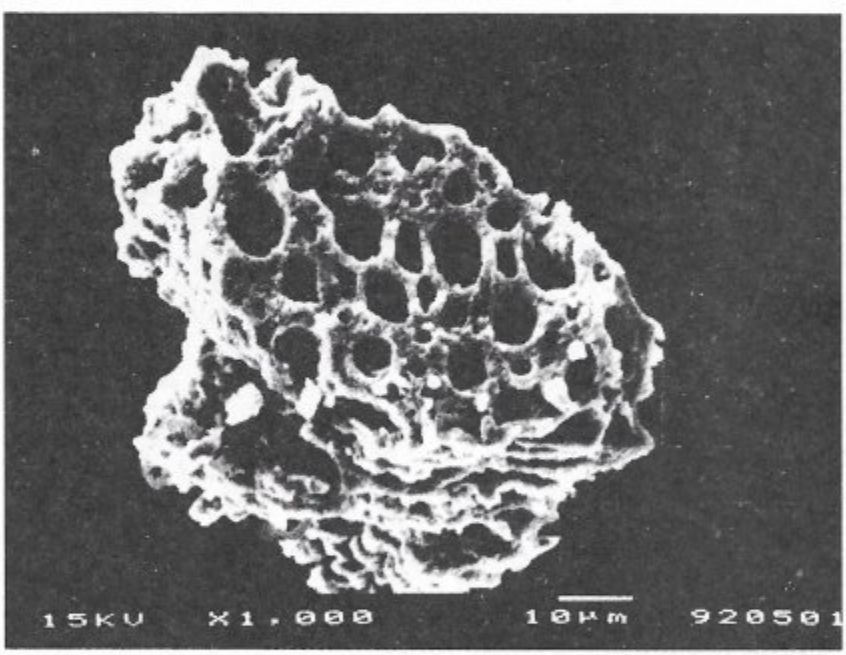

Figure 4. *A scanning electron microscope photograph of charcoal pigment used in a Hueco Tanks painting. Elemental analysis showed no manganese, a principal black pigment in paintings in the Lower Pecos region of Texas (Hyman et al. 1996).*

Scanning electron microscopy. A JEOL JSM-6400 scanning electron microscope fitted with an energy dispersive x-ray analyser (SEM-EDX) was chosen to study the morphology and major element composition of some of the samples. The instrument used is located in the Texas A&M University Electron Microscopy Center. The paint fragments were mounted on a standard aluminium SEM stub with double-sided stick tape. They were then coated with 100 µm of gold and palladium to render the surface electrically conducting. An example of charcoal observed in the paint is shown in Figure 4. EDX elemental analysis of that sample indicated it was primarily carbon, as expected for charcoal. There is no indication of manganese, a more common black pigment found in Texas rock paintings (Hyman et al. 1996).

Chemical pretreatment. The procedures for chemically pretreating archaeological charcoal are variable (Taylor 1987). Typically, limestone is dissolved with acid to remove ^{14}C-free carbonate carbon. Next, sodium hydroxide (NaOH) is used to dissolve the humic acid fraction that may be present. The sample is then re-acidified to prevent adsorption of atmospheric carbon dioxide (CO_2) caused by the NaOH. We eliminate the acid steps as we have shown them to be unnecessary with our technique (Chaffee et al. 1993, 1994a, 1994b; Hyman and Rowe 1997).

Plasma-chemical treatment. The plasma-chemical method used to extract organic carbon from ancient rock paintings has been described in detail elsewhere (Chaffee et al. 1993, 1994a, 1994b; Ilger et al. 1996), and thus will be discussed only briefly here. Ultra-high purity bottled argon and oxygen (99.999%) were used for all plasmas; the gases were passed through a liquid-nitrogen cold-finger to remove organic contaminants and water from the transfer line before entering the system proper. Oil-free pumps — liquid-nitrogen cooled sorption-pumps or ion pumps — were used to maintain vacuum conditions (to 10^{-7} torr). To eliminate organic contamination on chamber surfaces, oxygen plasmas were run in the empty chamber until ≤ 1 µg carbon, as CO_2, was generated. Samples were introduced into the chamber via a copper-gasketed, stain-less steel flange-sealed port under a flow of argon to prevent atmospheric CO_2, aerosols or organic particles from entering the system. After the chamber was resealed and the sample degassed under vacuum and heat, argon plasmas were run. Although an argon plasma is virtually non-reactive chemically, the energetic argon atoms and ions in the plasma desorb CO_2 molecules by inelastic collisions, removing them from the surfaces into the plasma gas that was then pumped out of the system. Vacuum integrity checks ensured that no significant leaks were present. These were followed immediately by oxygen plasmas that oxidised organic carbon in the rock painting sample to CO_2. The black colour of the samples disappeared when subjected to the oxygen plasma treatment, as expected for charcoal pigment. The CO_2 formed was frozen into a glass tube, flame sealed and sent for radiocarbon analysis to the Center for Accelerator Mass Spectrometry at the Lawrence Livermore National Laborato-

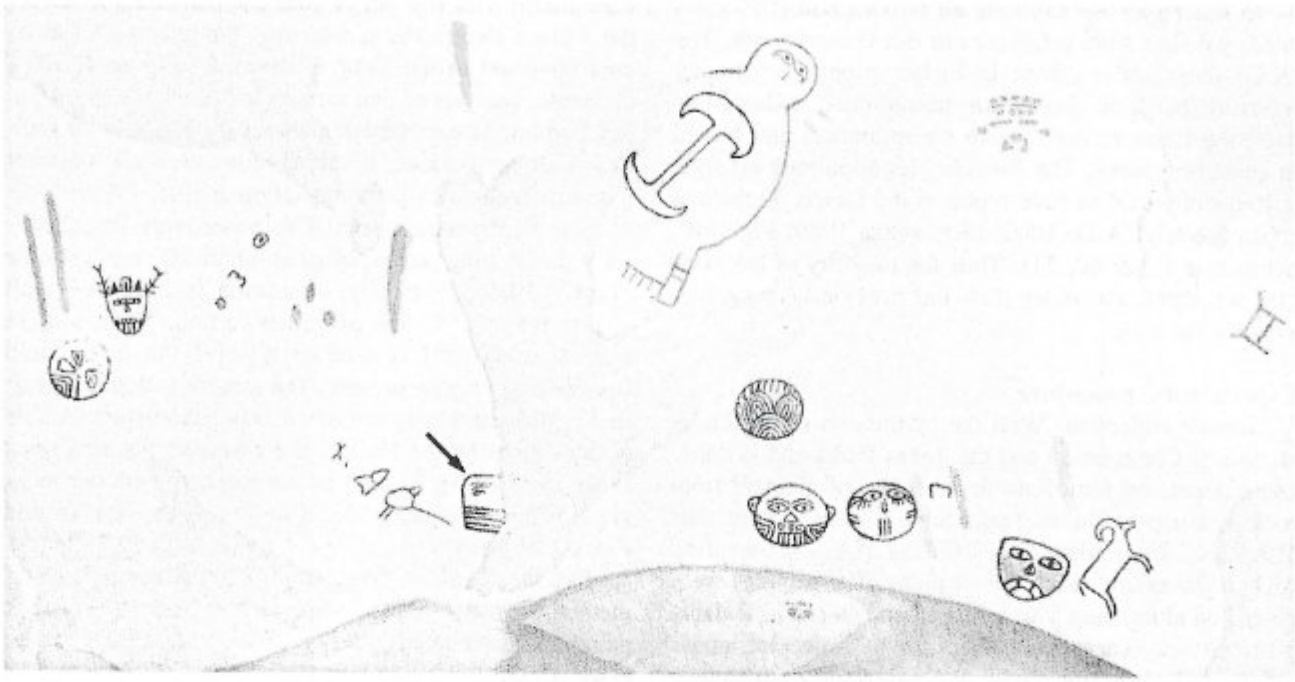

Figure 5. Hueco Tanks site 12. The motif sampled is a partially exfoliated figure (possible outline mask fragment) indicated by an arrow (Kirkland and Newcomb 1967: Pl. 131). Copyright © 1967. Courtesy of Texas Memorial Museum.

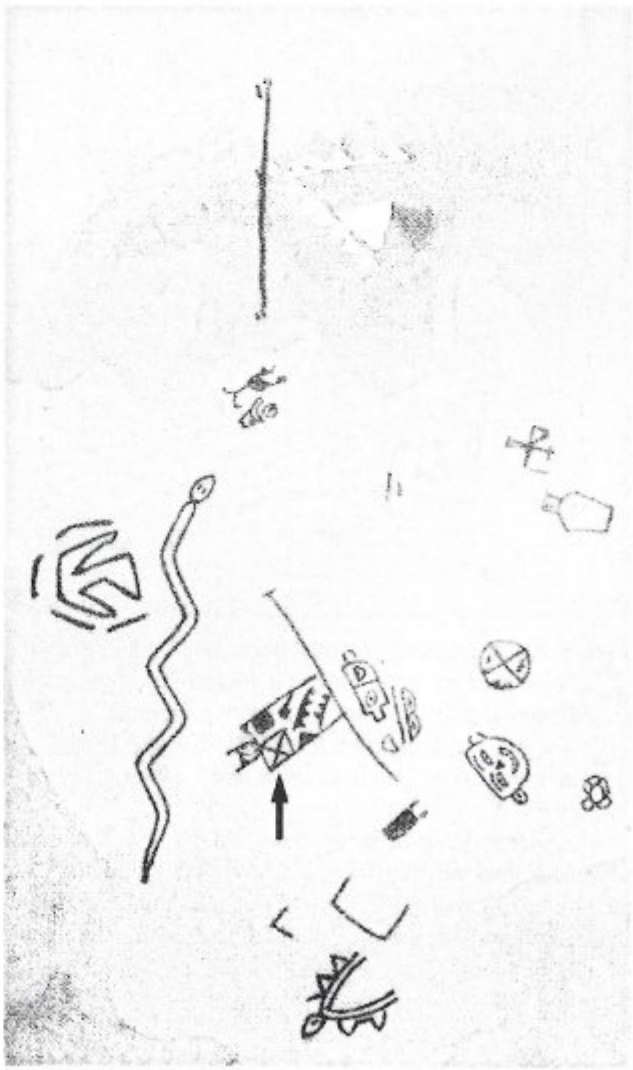

Figure 6 (on right). Hueco Tanks, site 20C. The motif sampled is a goggle-eyed figure indicated by an arrow (Kirkland and Newcomb 1967: Pl. 141). Copyright © 1967. Courtesy of Texas Memorial Museum.

ry (CAMS). Plasma conditions for the plasma oxidation of all the Hueco Tanks samples are summarised in Table 1.

Results

Table 2 contains the results of the radiocarbon analyses for those samples with sufficient carbon to yield reliable age estimates. Figure 2 is a graphical illustration of the calibrated A.D. dates and Figure 3 is a graphical illustration of the uncalibrated A.D. dates.

Sample information

Site 12A. This is a large open shelter high above the desert floor with three yellow solid 'masks' and multiple red and black outline 'masks'. Sample 12A-1 was taken from the indeterminate, partially exfoliated figure shown in Figure 5 (Kirkland and Newcomb 1967: Pl. 131). Plasma oxidation gave 300 μg carbon.

Site 20C. Sample 20C was collected from a degraded goggle-eyed figure (Figure 6) approximately a metre below the better preserved goggle-eyed figure at 20G discussed below (Kirkland and Newcomb 1967: Pl. 141). The sample was oxidised in an oxygen plasma, producing 120 μg carbon.

Site 20G. Samples 20G-1, 2, 3, 4 and 5 were collected from a large (50 cm × 40 cm) black and white goggle-eyed figure (Figure 7) that faces outward from

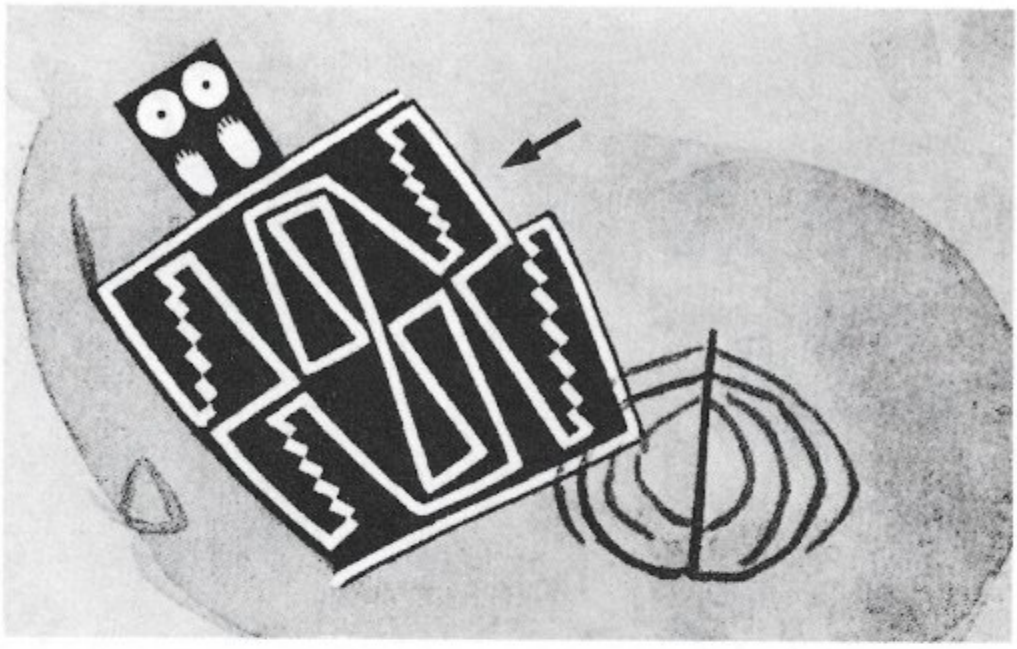

Figure 7.
Hueco Tanks, site 20G. The motif sampled is a goggle-eyed figure indicated by an arrow (Kirkland and Newcomb 1967: Pl. 141). Copyright © 1967. Courtesy of Texas Memorial Museum.

the shelter entrance, in a 'guardian' position (Kirkland and Newcomb 1967: Pl. 141). Samples 20G-1, 3, 4 and 5 were black charcoal pigment, 20G-2 was white pigment from the same painting. Inadvertently 20G-1 was not pretreated with NaOH and the radiocarbon analysis was, therefore, not reliable for providing an estimate of the age of the painting. Nonetheless, the sample was oxidised with the plasma and yielded 180 μg carbon as CO_2. The white pigment sample (20G-2) was also subjected to an oxygen plasma, but did not produce enough carbon (only 20 μg) to be accurately analysed for radiocarbon. Although the amount of carbon released by the oxygen plasma for sample 20G-3 was too small to provide a reliable date, the radiocarbon was nonetheless analysed. The date was returned as 'modern'; obviously the sample was seriously contaminated. We however saw no indication of a problem during the plasma treatment. The age obtained for 20G-4 (40 μg carbon) was 820 ± 260 years BP and that from 20G-5 was 1180 ± 80 years BP. The latter is a more reliable result because the sample was larger (140 μg carbon). Given that a small amount of modern carbon dioxide is a likely source of error, the effect of equal amounts of introduced modern carbon dioxide would be larger on smaller samples. Our best estimate for the date of the goggle-eye figure 20G is thus 1180 ± 80 years BP. Site 20 contains other goggle-eyed figures, outline 'masks', a solid 'mask', stars, a 'stepped pyramid', a 'turtle' and a 'mountain sheep' (see 20K).

Site 20K. Sample 20K-1 was removed from a black (charcoal) and yellow pigmented goggle-eyed painting shown in Figure 8 (Kirkland and Newcomb 1967: Pl. 142), located within ~20 metres of the goggle-eye paintings 20C and 20G.

Figure 8. Hueco Tanks, site 20K. The motifs sampled are a goggle-eyed figure, a 'mask', and representations of a 'sheep' and an anthropomorphous figure indicated by arrows (Kirkland and Newcomb 1967: Pl. 142). Copyright © 1967. Courtesy of Texas Memorial Museum.

Figure 10. Hueco Tanks, site 24. The motif sampled consists of seven centrally radiating lines indicated by an arrow (Kirkland and Newcomb 1967: Pl. 146). Copyright © 1967. Courtesy of Texas Memorial Museum. (Note: Figure 9 is located on the front cover of this issue.)

After chemical pretreatment, plasma oxidation produced 370 μg carbon as CO_2. Although sample 20K-1 gave adequate carbon for radiocarbon analysis, it gave an age estimate of 2010 ± years BP. This age is old enough for us to doubt its validity. Unfortunately radiocarbon analysis was conducted on the 20K samples before it was recalled that the panel had been vandalised by spray paint and subsequently cleaned (Davis and Toness 1974). This almost certainly affects the radiocarbon date, yielding an age too old because of contamination with fossil carbon in the spray paint and in materials used in the cleaning.

20K-2 is a 'mask', found just beneath the goggle-eyed motif 20K-1. When oxidised, 20K-2 yielded 170 μg carbon as CO_2. Samples 20K-3 and 4 were from representations of a 'sheep' and anthropomorph, respectively. All four motifs are on the same ~1 m^2 panel. Only 20 μg carbon were produced from the oxygen plasma reactions of 20K-3 and 4. Therefore they were not analysed for radiocarbon. We attempt in every case to minimise paint removal. In some cases, this results in samples that do not yield enough carbon for a reliable radiocarbon determination.

Site 23C. This is a large open shelter containing nine 'masks', two 'mountain sheep', several anthropomorphs, and multiple mortar holes. Sample 23C-1 charcoal pigment was collected from a squared circle shown in Figure 9 (see front cover) (Kirkland and Newcomb 1967: Pl. 144). The sample was oxidised, yielding 460 μg carbon as CO_2, the largest amount of CO_2 from any of the Hueco Tanks samples. Sample 23C-2 was charcoal pigment from the upraised left arm of the anthropomorph shown in Figure 9. Plasma oxidation generated 180 μg carbon. No radiocarbon analysis was obtained for this sample as the CO_2 was lost during the graphitisation step in preparation for AMS dating.

Site 24F. This large open shelter contains dozens of pictograms, including an exquisitely painted minuscule red 'deer' and two 50 cm tall white painted anthropomorphs with 'mountain sheep headdresses' facing each other in profile with arms raised. Sample 24F was charcoal pigment from seven lines (~2 cm long) radiating from a small solid circle (~3 cm diameter) shown in Figure 10 (from Kirkland and Newcomb 1967: Pl. 146). Though this is not a diagnostic Jornada Mogollon motif, the site contains many Jornada Mogollon images. The sample was reacted in an oxygen plasma producing 70 μg carbon.

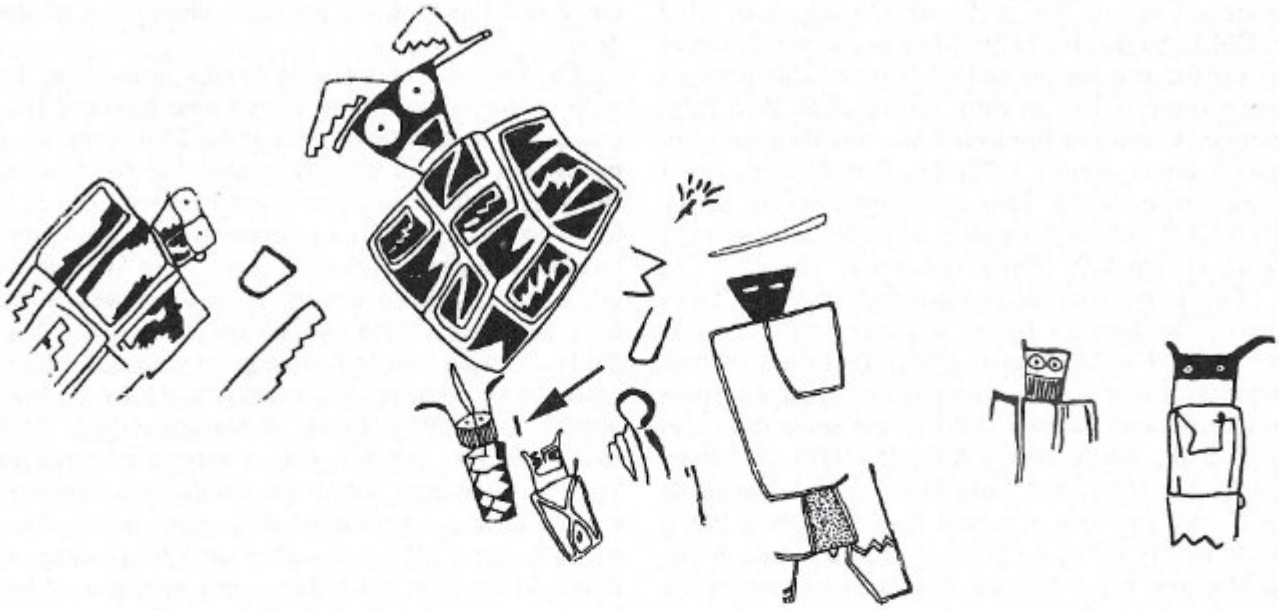

Figure 11. Hueco Tanks, site 28. The paint sampled was from a streak (indicated by the arrow) below the largest goggle-eyed figure. This drawing of the panel is from Davis and Toness 1974 and used with permission of the El Paso Archaeological Society, Inc. The largest figure is approximately 75 centimetres high. The site was discovered by Nicholas Houser in 1969.

Site 28. Entry to the site requires kneeling. There are seven well preserved goggle-eyed figures (shown in Figure 11 from Davis and Toness 1974: 76) and numerous mortar holes. Sample 28A was taken from a black streak below the largest goggle-eyed figure shown in Figure 11. The charcoal paint of the streak looked similar to that of the figure above it. An oxygen plasma generated 420 μg carbon as CO_2. Clearly, the streak itself may not be related to Jornada Mogollon paintings although it is located among them. Once again, as with sample 24F this brings up a problem: archaeologists and chemists are reluctant to take samples from intact paintings. However, the value of a date is lessened when such a clear association of the sample with a genre is lost.

Discussion

Whalen (1994) sets forth the chronology of the Hueco Tanks vicinity: Palaeo-Indian followed by Archaic; Formative (sometimes called Mesilla phase) from 'A.D. 0 to 1100'; Transitional (or Dona Ana phase) from 'A.D. 1100 to 1200'; Pueblo (sometimes called El Paso phase) from 'A.D. 1200 to 1400'. Our age estimates for the seven paintings sampled at Hueco Tanks overlap occupation dates for pithouses excavated nearby: at Turquoise Ridge (Whalen 1994) and at Hueco Tanks State Park (Kegley 1979).

Turquoise Ridge, in the basin edge zone of the Hueco Bolson, was used from about 'A.D. 500 to 1000', probably as a winter base camp (Whalen 1994: 44). A chart in Whalen (1994: 39) lists dates of houses ranging from 1500 ± 50 B.P. to 1080 ± 30 BP; 2σ cal. A.D. 430 [560, 570, 590, 600] 650 to 2σ cal. A.D. 890 [980] 1020). Pits scattered throughout the site stored resources gathered from the basin during warmer seasons. After about 'A.D. 750' the scale of processing wild plants increased at the site (Whalen 1994: 129). Based on his study of small sites, Maudlin (1994) suggests a decreased use of the basins and an increased use of the Piedmont areas at the same time. As postulated from settlement pattern surveys, population density also increased (Carmichael 1985: 14). During the late Formative period, there is evidence of the use of round communal or ceremonial rooms, slightly larger than the residential units, with a bench around the interior edge. At least three large pithouse sites in the Jornada region have these structures: Los Tules (Lehmer 1948) and Rincon (Hammack 1962) in the Rio Grande Valley and in the Hueco Bolson, Turquoise Ridge (Whalen (1994). This large, round pithouse at Turquoise Ridge dates to 'A.D. 820 ± 60' (Whalen (1994: 47). The appearance of these proto-kivas suggests a ceremonial life that may have had at least some of the characteristics of the ceremonies associated with kivas in present-day Pueblos.

The vast majority of ceramic shards recovered from Turquoise Ridge are undecorated El Paso Brown (99.6%) (Whalen 1994: 41). The few intrusive shards large enough to classify are: two Three-Circle Red-on-White (c. 'A.D. 700'); ten Mimbres Boldface or Transitional (c. 'A.D. 750-1050'); two Classic Mimbres (c. 'A.D. 1000-1150') (Whalen 1994: 41-2). Fourteen ornaments made of shell from the Gulf of California were found in a Turquoise Ridge structure dated to 'A.D. 820' (Whalen 1994: 127).

The remains of a roof-support post of a pithouse at

the base of the Hueco Tanks outcrops gave a single radiocarbon age of 800 ± 50 BP (2σ cal. A.D. 1160 [1260] 1290) (Kegley 1979). The single date is bolstered by the fact that the site yielded 'a remarkably homogeneous collection' of an early variant of El Paso Polychrome; Chupadero Black-on-White was the most common intrusive (Kegley 1979: 20). Perttula et al. report dates for early El Paso Polychrome as c. 'A.D. 1000/1100' and for Chupadero Black-on-White from c. 'A.D. 1150 to A.D. 1650' (Perttula et al. 1995).

Five of our dates of rock paintings at Hueco Tanks overlap the dates for houses at Turquoise Ridge determined by Whalen (Whalen 1994). Two dates of rock paintings overlap the date given by Kegley for a pithouse at Hueco Tanks (Kegley 1979). These seven dates also overlap the late Classic ('A.C. 150-600'), Epiclassic ('A.C. 600-900'), and early Postclassic (beginning at 'A.C. 900') periods of central Mexico (Nelson 1997). As Wimberly states, the presence of maize in the Jornada Mogollon region makes a Mesoamerican connection a fact by 3000 BP, most likely 'transported from Mesoamerica over existing communication routes' (Wimberly 1979: 86). Maize from Tornillo Shelter in southern New Mexico dated to 3175 ± 240 BP (2σ cal. B.C. 2030 [1430, 1420, 1410] 830) (Upham et al. 1987). At Fresnal Shelter in south-eastern New Mexico, ten maize and bean samples dated between 2945 ± 55 (2σ cal. B.C. 1370 [1210, 1200, 1190, 1180, 1150, 1140, 1130, 1120, 1110] 940) and 1665 ± 55 BP (2σ cal. A.D. 260 [410] 540) (Tagg 1996). The Cerro Juanaquena complex in far northern Chihuahua, Mexico, near the New Mexico and Texas borders, is dated at 3000 BP, based on radiocarbon ages of maize (Hard and Roney 1998). Transport of goods went south as well as north. Using neutron activation analyses, Weigand et al. (1977) and Weigand and Harbottle (1993) document transport of turquoise from Cerrillos, NM (directly north of Hueco Tanks), to central Mexico by 'A.D. 400'. This long-term, long-range contact may have transmitted imagery as well as material objects.

The concentration of 69 solid painted 'masks' (such as those shown in Figure 9, Toness and Hill 1972) distinctively marks the Jornada Mogollon at Hueco Tanks. These solid 'masks' are usually found in isolated niches or more inaccessible small shelters; no two are exactly alike. In contrast the 47 known painted outline 'masks' at Hueco Tanks are found in large open shelters showing extensive habitation. These solid painted 'masks' are rare other than at Hueco Tanks. Outline 'masks' occur more frequently, though most often as petroglyphs — for example in the Rio Grande valley and Tularosa Basin (Schaafsma 1992: Figs 89-94). No solid 'masks' were sampled for dating at Hueco Tanks; their pristine condition precluded that. In any case, their thin washes may indicate little organic matter. One 'mask', one possible outline mask fragment, a star, and two goggle-eyed figures were among the motifs sampled. Their radiocarbon age estimates range from 1350 ± 160 to 1010 ± 70 BP. Radiocarbon analyses and calibrated calendar ages for the Hueco Tanks samples are tabulated in Table 2; Figure 2 and Figure 3 are graphical illustrations of the dates.

The similarity of the solid 'masks' painted on the walls of Hueco Tanks to the carved stone masks of Teotihuacan is striking (Schaafsma 1980: 240). Only three masks have been scientifically excavated at Teotihuacan, but hundreds are known (Berrin and Pasztory 1993: 184-93). Though counterfeits are common, more masks survive from Teotihuacan than from any other Mesoamerican culture. They do not appear to have been worn, being too heavy and the eyes are not cut through. Their flat heads, wide straight foreheads, strong parallel horizontals of the deep eyes and mouth echo the solid 'mask' paintings of Hueco Tanks. Schaafsma (1980: 241) emphasised that hers was only a general reference to Teotihuacan because 'the civilization that was Teotihuacan collapsed ... several hundred years before these masks appeared'. Our radiocarbon dates for paintings at Hueco Tanks show that at least some were painted before that collapse ('A.D. 750'; Millon 1993).

One of the more spectacular of the painted 'masks' at Hueco Tanks is 58 centimetres tall, with a conical headdress topped by a plumed horned head (Davis and Toness 1974: Fig. 10-F). The plumed horned head is similar to 'horned serpents' at Hueco Mountains, 1.6 kilometres west of Hueco Tanks (Sutherland 1976), and at Alamo Canyon, 65 kilometres south-east of Hueco Tanks (Sutherland and Steed 1974: 43; Sutherland and Giese 1992). Davis and Toness comment on the seeming Mesoamerican influence of this figure and a pair of solid 'masks' with conical headdresses at Hueco Tanks (Davis and Toness 1974: Figs 29-A-3 and 29-A-4). In the latter, negative overlapping fish-like shapes form its mouth. The plumes of the 'mask' at Hueco Tanks and the 'horned serpents' at Alamo Canyon and Hueco Mountains are reminiscent of the tassels and feather plumes in Teotihuacan murals, for example the figures with ringed eyes in the Metepec phase murals dated between 'A.D. 650 and 750' photographed in Berrin (1988: Pls 39-41). Berrin (1988: Pl. 38) also contains photographs of a Teotihuacan mural of coyotes with similar mouth and teeth to the 'coyote' painting in Alamo Canyon shown in Sutherland and Steed (1974: 41).

In addition to the solid 'masks', a Mesoamerican influence has also been postulated for the goggle-eyed figure that occurs across the Jornada Mogollon region in 'nearly every rock art site or site cluster' (Schaafsma 1980: 236, 238). At least 24 painted examples of this figure have been reported at Hueco Tanks. They are characterised by ringed eyes, a square or rectangular head over a rectangular armless, legless body with symmetric internal geometric or step fret designs. The similarity here is to the Storm God, one of the principal deities of Teotihuacan, associated with rain and lightening as well as foreign relations, war and trade. It appears in carvings, ceramics and murals. Covarrubias (1957: Fig. 22) charts the evolution of the rain god from the Olmec were-jaguar. The Temple of the Feathered Serpent built

in approximately 'A.D. 150' has carvings of a headdress with goggle-eyes on its facade (Berrin and Pasztory 1993: 49). This goggle-eyed headdress is identified by some as representing the Storm God, by others as representing a feathered serpent, and by others as a fire serpent (Berrin and Pasztory 1993: 37, Note 14). Storm God features were stylised well before 'A.D. 150' as evidenced by ceramic effigy vessels dating from 'A.D. 1-150' (Berrin and Pasztory 1993: 240-2). An early Classic olla photographed in Miller (1986: Fig. 56) is painted with a bright-blue goggle-eyed figure carrying a pouring vessel. Berrin and Pasztory (1993: Fig. 140) show a tripod ceramic vessel stuccoed and painted with a goggle-eyed figure wearing a tasselled headdress dated from 'A.D. 550-650.' They also show a goggle-eyed mould-made figurine with an elaborate feathered and tasselled headdress (Berrin and Pasztory 1993: Pl. 98). The ringed-eyed figures in the murals mentioned above are in profile. Murals with variations of forward-facing goggle-eyed figures occur in other compounds. The goggle-eyes appear on figures of warriors in addition to the Storm God and other deities. Photographs in Miller (1973) show a border in a Tepantitla mural with a headdressed ringed-eye figure holding small ringed-eye figures in both arms (Figure 12, from Miller 1973: Fig. 163).

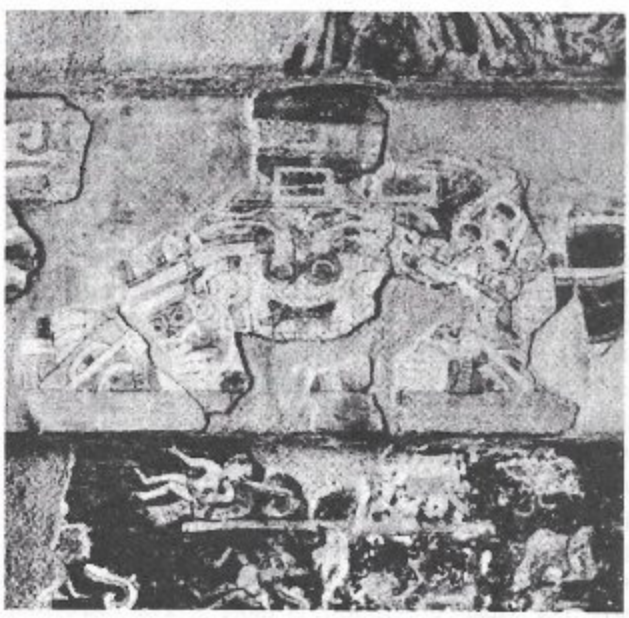

Figure 12. Teotihuacan, Tepantitla complex, Portico 2, Mural 3, detail of the border between the upper and lower walls showing a goggle-eyed figure holding two goggle-eyed figures in its arms, from The mural painting of Teotihuacan *by Arthur G. Miller (Figure 163). Copyright © 1973. Courtesy of Dumbarton Oaks.*

At the Tetitla complex a ringed-eyed figure in a feathered headdress holds a small ringed-eye figure in one hand and a large wavy pointed object in the other (Figure 13, from Miller 1973: Fig. 249). Elsewhere at Tetitla is a headdressed goggle-eyed figure (Figure 14, from Miller 1973: Fig. 261). Ringed-eyed imagery continued at Teotihuacan at least until portions of the city were burned in 'A.D. 750' (Millon 1993). During the next century the population declined but the city remained a major urban center, only Tikal being larger (Diehl 1989).

Mesoamerican regions in contact with Teotihuacan also used the ringed eye motif. Pasztory (1974), for example, discusses its oft-cited use on a shield carried by a figure on Stela 31 at Tikal. Schele and Friedel (1990: 130-216) show the motif at other Mayan sites, including Piedras Negras and Dos Pilas. Pasztory (1988) traces the use, changes and reinterpretation of the goggle-eyed figure and headdress, from Teotihucan to the Spanish Conquest.

In suggesting formal parallels between goggle-eyes and 'masks' on the walls of Hueco Tanks and those of Mesoamerica, we do not imply ideological equivalency or a direct connection, merely the widespread use of the two motifs. Teotihuacan was the largest cultural centre known in North America before European contact. Its relationships were both direct and indirect. Its influence in Guatemala and northern Mexico declined by 'A.D. 600'; and after 'A.D. 700' its direct ties are only with Veracruz (Diehl 1989). Its indirect influence was felt all through Mesoamerica and on the northern periphery.

Kelley (1956) writes of a Mesoamerican cultural occupation zone extending from central Mexico through Zacatecas, and Durango to Chihuahua in northern Mexico following the eastern foothills of the Sierra Madre Occidental. Different regional centres were most active at different times. Turquoise from New Mexico was taken to the Chalchihuites area and worked into objects for export to central Mexico (Weigand et al. 1977). By 'A.D. 650-750' the area was producing Gualterio Red-on-Cream plates and shallow bowls with geometric bands circling the interior, or on occasion with life forms in opposed quadrants (Kelley 1971, 1974, 1985). Emigrants from this area established colonies near Durango and a strong Mesoamerican development took place there beginning c. 'A.D. 875' (Kelley 1985).

To researchers working in the region, for example Lister (1960) and Kelley (1971), the Mogollon were a part of this chain of related cultures and people. Foster (1986) states 'the adaptations in material culture, subsistence patterns and settlement patterns prior to A.D. 1000 along the eastern foothills of the Sierra Madre Occidental from central Zacatecas into the central mountains of western New Mexico and eastern Arizona are quite similar'. Indeed Turner (1993), analysing the teeth of living and pre-Historic south-west populations, most closely connected the Mimbres Mogollon with northern Mexico.

Hueco Tanks State Historical Park contains the largest known concentration of Jornada Mogollon rock paintings. The radiocarbon ages of the seven paintings sampled overlap radiocarbon dates of habitation sites in the vicinity. The paintings represent a major change from the earlier Desert Archaic paintings. People have

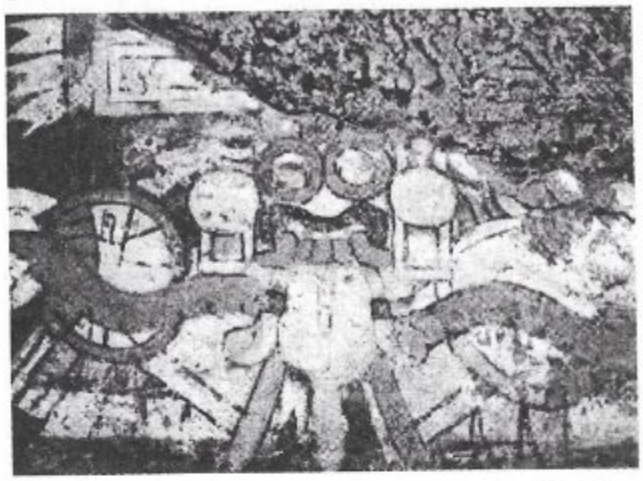

Figure 13. Teotihuacan, Tetitla complex, Corridor 21, Mural 1, showing a goggle-eyed figure holding a wavy atlatl, from The mural painting of Teotihuacan *by Arthur G. Miller (Figure 249). Copyright © 1973. Courtesy of Dumbarton Oaks.*

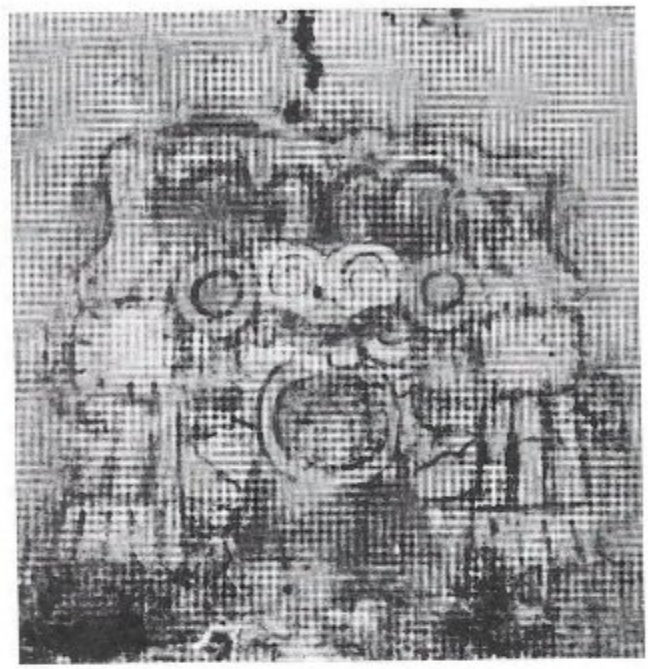

Figure 14. Teotihuacan, Tetitla complex, Room 19, Mural 5, showing a headdressed goggle-eyed figure, from The mural painting of Teotihuacan *by Arthur G. Miller (Figure 261). Copyright © 1973. Courtesy of Dumbarton Oaks.*

looked to fifteenth century Aztec codices and Casa Grandes (occupied mainly from 'A.D. 1250-1500'; Lekson 1997) for influences regarding this change, but the radiocarbon ages we have determined for seven Jornada Mogollon rock paintings at Hueco Tanks show that any interactions bearing on the paintings would have occurred much earlier.

However, caution needs to be exercised when interpreting any charcoal-derived radiocarbon age. The 'old wood problem' (Schiffer 1986) applies to pictograms as well as other archaeological charcoal. The possibility that the ages obtained are older than the archaeological event being dated, the time of production of the rock painting in our case, cannot be eliminated. The interpretation of charcoal dates is dependent upon a number of assumptions: species used, longevity of source, preservation, environmental conditions, cultural behaviour, and population densities affecting wood use (Farrell and Burton 1992; Smiley 1994; Fetterman 1996). Although some of the rock painting ages are older than had been generally anticipated, they are, in fact, consistent with other dates on habitation materials for the general region. Whalen (1994) used AMS dates of annual plant material to examine the possible effect of the 'old wood problem' on dates at Turquoise Ridge (in the immediate vicinity of Hueco Tanks). He concluded, 'It is significant, that the two techniques (AMS radiocarbon dates on seeds and standard radiocarbon dates on wood from structures) agree in placing both houses in the early part of the Formative period. This, in turn, argues that the standard radiocarbon dates should not be dismissed as old-wood-biased readings' (Whalen 1994: 40). The proximity of Turquoise Ridge to Hueco Tanks and the overlapping dates make it reasonable to expect that Whalen's conclusion can be extrapolated to Hueco Tanks. Nevertheless, another problem remains: the taphonomy of the charcoal in our paint samples is unknown.

We also acknowledge that there are additional limitations in using radiocarbon content to estimate the age of rock paintings arising from, among other issues, the lack of uniformity of paint samples and rock surfaces, organic carbon in the basal rock and mineral accretions, and animal or human interference. For example, sample 20G-3 gave an age indicating contamination with modern carbon. Sample 20G-2 showed no visible charcoal, but yielded 20 μg of carbon, possibly reflecting pigment, an unidentified paint binder, contamination by microscopic biota, or airborne debris. Exactly what organic material or materials produced the carbon being dated in these samples is unknown. Therefore, the current method cannot provide an unequivocal relationship between the radiocarbon content and the age of the painting. The problems of identifying the organic material in ancient paint samples remain to be solved. Consequently the results given in this paper cannot be considered conclusive, but remain provisional. A more general discussion of these issues and methodologies of direct rock art dating is given by Bednarik (1996).

Acknowledgments

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Résumé. *Des milliers de peintures s'observent sur les parois et les plafonds des abris sous roche de trois affleurements granitiques dénommés Hueco Tanks, à l'est d'El Paso (Texas). Sept peintures ont été analysées, elles donnent des dates au radiocarbone s'étageant de 1350 BP à 740 BP. Ces peintures relévent du style Jornada de la région de Mogollon, style qui inclut, figurés soit en aplat soit au simple contour, des 'masques', des 'pyramides à degrés', des 'serpents à cornes', des personnages à yeux exorbités, des 'oiseaux' et des 'danseurs à grandes coiffures'.*

Zusammenfassung. *Tausende von Malereien sind auf den Wänden und Decken von Abris in den drei als Hueco Tanks bekannten Granit-Formationen östlich von El Paso, Texas. Analysen von sieben Felsmalereien ergaben eine Serie von Radiokarbon-Daten von 1350 BP bis 740 BP. Die Felsbilder gehören zum Jornada Style vom Mogollon Gebiet, das ausgefüllte und Umriß-'Masken', 'Treppen-Pyramiden', 'gehörnte Schlangen', glotzende Figuren, 'Vögel' und 'Tänzer mit Kopfschmuck' einschließt.*

Resumen. *Miles de pinturas se encuentran en las paredes y techos de abrigos en los tres afloramientos de granito al Este de El Paso, Texas, conocidos como 'Hueco Tanks'. Los análisis de siete pinturas revelan una serie de fechas de radiocarbono desde 1350 a.P. al 740 a.P. Las pinturas pertenecen al Estilo Jornada de la región Mogollon, que incluye 'máscaras' sólidas y de contorno, 'pirámides escalonadas', 'serpientes con cuernos', figuras con ojos saltones, 'aves' y 'bailarines con tocados'.*

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RAR 16-492

KEYWORDS: *Eye movement - Scan sequence - Visual perception - Image - Palaeolithic*

THE ANALYSIS OF SCAN SEQUENCES EMBEDDED IN PALAEOLITHIC PARIETAL IMAGES

Michael Eastham

Abstract. The manner in which the eye scans objects and voids in the visual field of the modern western European and the way in which instructions concerning scan procedures are selected when creating a visual image are used to analyse Palaeolithic parietal images for meaning. Out of the comparison of the differences emerges an interpretation of the meaning of the Palaeolithic images which concentrates on the stance, balance and other behavioural characteristics of the animals represented.

Introduction

Visual transmission of ideas, whether the designer be Palaeolithic or alive today, depends ultimately upon the nature of the processes of visual perception. They are processes which are in the main shared with a number of mammals and possibly also some birds. What human beings do not share with any other extant species and which may in fact be a defining characteristic of humanity is the ability to deconstruct these perceptions and to make notations which enable others to reconstruct them. The nature of the relationship between what is seen during the moments of visual perception and the marks made to guide an observer through its reconstruction, therefore, constitute the primary meaning of any depiction, whether Palaeolithic or recent.

It has to be assumed that the Palaeolithic designers intended their images to be understood by others. There is no proof that they are utterances designed to be understood by anyone else: even by the designer's immediate group with whom there must have been frequent if not continuous contact. However, it is a not unreasonable assumption that the pictures were not merely done for self-gratification. There are at least two good reasons for supporting the contention.

The first reason is that images cut into or painted onto the surfaces of rocks and into the recesses of caves involve a degree of organisation and sustained effort that precludes their being frivolous. The collection of materials for an image, the walk from the occupation site to the image site — they are seldom the same — the varied time span spent on the completion of the drawing of a single figure and the return, comprise, in total, a task which might be expected to take up more than half a day. In this alone, parietal images have an intentionality which personal decorations and even proprietary marks on artefacts do not have.

A second, more important reason lies in the nature of the image itself. At least since Plato enunciated the idea in the Republic and the Philebus, mimetic pictures intended to look like something in the humanly visible world have been generally recognised as suitable communications between people who lack the easy habit of understanding each other's thoughts but nevertheless want to (Plato 1955: Sec 595-603, 1871: Sec. 60ff.). There is no reason to suppose, however, that Socrates was the first to think of the idea. Not all Palaeolithic images are wholly mimetic or perhaps even intended to be but a substantial proportion look as though that could have been the designer's idea. The implication is that they were intended for people he or she did not know.

If communication with strangers is invariably the intention of mimetic images, then the meaning that can be discovered by reconstruction of the directions intended by the marks ought to prove to be the primary meaning, not only of the Palaeolithic images so ancient that no verbal tradition about them survives, but also of the more recent similar images made by designers who can be spoken to. What follows is therefore an observational study of the marks in a number of Palaeolithic images. It is compared with some of the results of two more interactive studies of the way in which people learnt to make drawings for a variety of recent or contemporary purposes.

The first of the comparative sources derives from an extended study of the drawing activities of a total of approximately 4500 design students with whom the author was involved. They were learning to use line and colour for graphic and product design purposes. Most

were from the north of England but there was some diversity. An eighteen-year-old Singhalese male student training to be a garment pattern cutter and garment designer, another eighteen-year-old male Malay with a similar purpose, a twenty-one-year old Hong Kong Chinese female student training to be a graphic advertising designer and a twenty-nine-year old Afghan training to be a photographer were of particular interest. Even so there was inadequate representation of diverse human populations and published psychological experimentation was referred to in an attempt to extend the sample, but it suffers from the same difficulty. Subjects presenting themselves for experiment in a laboratory would need to learn different cues to those learnt chasing game in the Ardèche gorge thirty thousand years ago. If some of the problems can be shown to be shared with a cat and a monkey, the difficulty is certainly decreased, but a great many of the important problems cannot be shown to be shared with animals who do not draw.

Perception of objective and drawn images by modern western Europeans

The central region of the human retina, the region of maximum acuity, the fovea of the average student, can be shown to focus a roughly circular cone of approximately two degrees of arc, the area being demonstrably variable from subject to subject. It can also be readily demonstrated that it is upon the image projected on this very limited area that most of the interpretative facilities of the student's processes of visual perception are directed. The observation is confirmed by microscopic section which apparently shows that the overall 12.5 : 1 ratio of light receptors to nervous connections to the brain equates to 1 : 1 in the central foveal area. In the remainder of the retina with a less favourable ratio, the sectors with ratios heavily in excess of 12.5 : 1, the information provided must inevitably be restricted (Hubel 1995: 45f).

Round the periphery of the eye only a limited quantity of data is received. It is just sufficient for enough edge discrimination and orientation to enable the determination of the changes of shape which indicate movement and therefore presumably possible danger to be made, and no more. Only the centre provides enough information about colour, texture, the direction of boundaries and therefore the comparative size of shapes which can be used to discern distance and assess the nature of objects. Perception of an object involves scanning an area of space with the central receptors and subsequently reassuring the perceptual process with stimuli from peripheral receptors that the changes in luminescence, the boundaries, the shapes perceived by the central receptors have not gone away or otherwise moved as the axis of the eye moves again to fix momentarily upon adjacent surfaces in space.

With a normal human lens system, the image projected on the central area amounts to a circle of visibility about one and three-quarter centimetres in diameter at a normal arms length of around half a metre and a proportionate size at greater distance. One's own thumbnail can be focused in its entirety but very little more of the thumb is clear. A large tree or a house both focuses well and fills the field of maximum acuity at about a kilometre but a group of trees or a block of flats is getting very indefinite round the edges. The most important factor, however, is that most of the objects which are of importance, which interest us and with which we interact, can only be seen in part at any one instant. Eye movement scanning the whole, and the determination of an order of movement of the eye across the limits of visual space around one, is therefore an essential activity of perception.

Eye movement proceeds, when the object is stationary, not in a continuous sweep but in a series of jerks. Two types of movement are observable. One is small, involuntary and only readily noticeable as an increasing problem in subjects whose eyesight is deteriorating from some clinical condition. The important movements are larger, voluntary and directed by the desire to understand the nature of what is being projected onto the retina. When for some reason it is the movement of an object itself which is important, a situation which is seldom explored in the drawing studio, the eye follows the moving object and the perception process usually fails to register the changes of shape which generate that movement. The scanning process interprets luminance differences and establishes a boundary. It distinguishes the boundary as a shape of an object against a ground or as changes in the ground as a boundary moves. They are separate; movement and shape cannot both be seen at the same time. Laboratory experiment has shown that the angle and direction of eye movement provides dimensional information while fixation occurs when small differences of direction at boundaries have to be assessed (Pritchard 1961; Hubel and Wiesel 1959).

Drawing teachers have long explored this habit of the eye. It is the business of 'going for a walk with a line' as Paul Klee put it (Klee 1945, 1953; de Piles 1708; Vasari 1568: sec 75-6; de Honnecourt c.1220: f.35-38). They have long recognised that different viewers looking at a stretch of terrain will see different elements. The eyes of someone interested in ornithology will flick quickly from one fixation point to another in order to discover the suitability of the cover and food supplies for birds and the peculiarities of any species visible. The person brought up among farmers will search for evidence of the cropping, of livestock potential and the agricultural equipment on the land in front. Someone who as a youngster has crouched on his heels with his back against the wall listening to the talk of miners will look at the rock outcrops, the land profile, the evidence of sedimentation and the other clues to what is going on below the land surface. All of them will ignore elements noted by the others. They will not only tell of this, they will also make credible drawings of aspects of their interests which are not easy to describe verbally.

During the late 1950s the psychophysicist Alfred L. Yarbus showed the same thing with mechanisms attached to the cornea of a human eye and others have subse-

quently repeated his experiments (Noton and Stark 1972; Gandleman 1986). He started with a proposition established by predecessors that 'the eye requires some degree of constant movement ... of the retinal image' in order to work (Yarbus 1967: 59). He initially used his experimental method to confirm that the eye, fixated on a constant source that does not dither through up to about 8 seconds of arc, ceases to differentiate anything after about 2 to 3 seconds. He then confirmed the conclusion that this process is both necessary and relatively involuntary by replacing the constant light source with one that flickered and observing the frequencies at which vision was eliminated or restored.

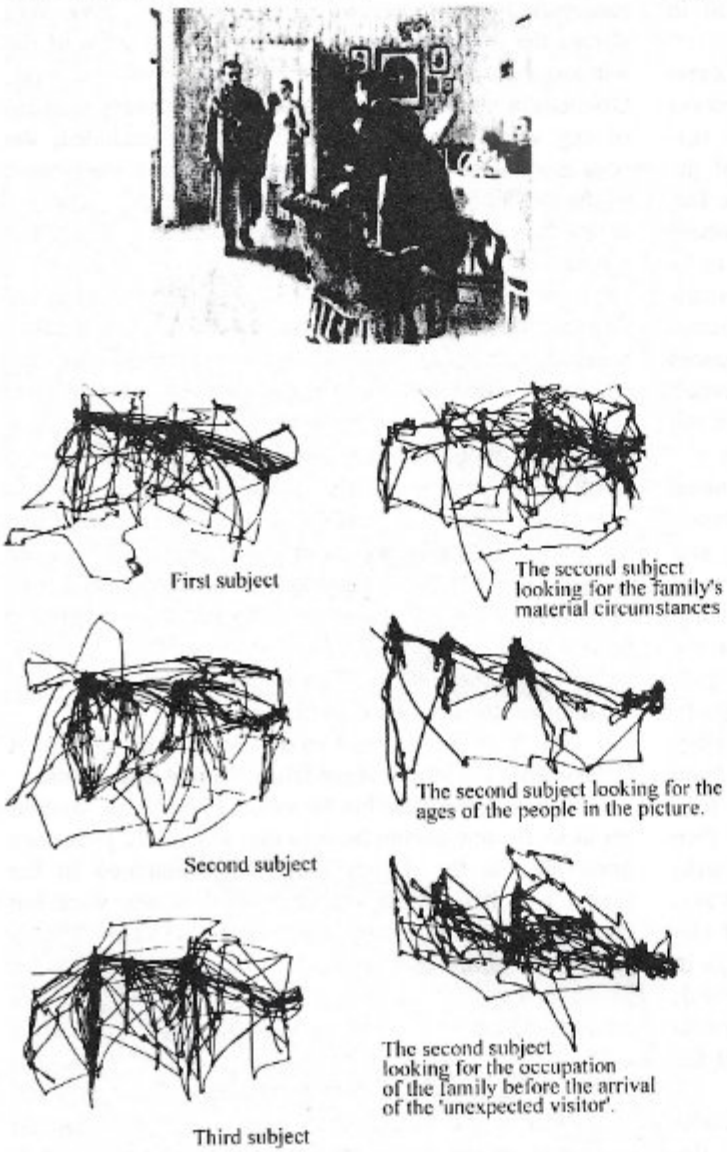

Figure 1. *Phototraces of the eye scan sequence of three subjects looking at a painting by I. E. Repin, recorded by Alfred Yarbus.*

In later experiments Yarbus went on to explore voluntary eye movements and recorded the scan patterns of a number of viewers over several pictures. A photograph of a rather sultry woman and a print of a Russian realist painting called *The Unexpected Visitor* by I. E. Repin were amongst the things used but spatially disposed objects were not. In the circumstances it is scarcely surprising that the initial scan patterns of the realist painting, some of which are shown in Figure 1, made by normal subjects are quite remarkably similar to each other (Yarbus 1967: 172). It is also not surprising that when a single subject was asked questions on the 'material circumstances' of the family, the 'ages of the people' and what they had been doing before the arrival of the 'unexpected visitor', different scan patterns ensued (1967: 174).

The pattern obtained for the photograph of the head is particularly interesting, but not only because the visual data presented by the experiment might be thought to approach the random quality of data reflected by solid surfaces in real space (Yarbus 1967: 179). As can be seen in Figure 2, the eye is shown to make two different sorts of movement: to answer two distinct questions.

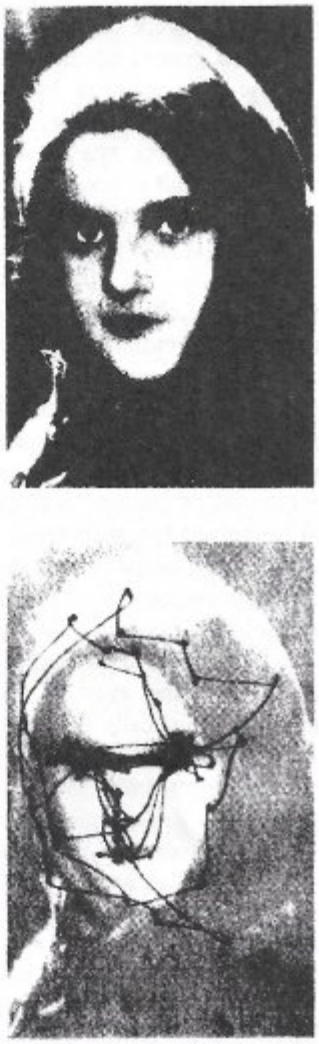

Figure 2. *Phototrace of the eye scan sequence of a subject looking at a photograph of a woman, recorded by Alfred Yarbus.*

One sort seeks the position of each arris or shed line between side-face and front-face until sufficient infor-

mation is accumulated to assure the viewer that the head is a relatively symmetrical solid and not deformed. The second sort concentrates on the exact shape of mobile parts, eye lids, eye brows, nostrils and lips, that betray mood, personality, genealogy and other socially important information. There is no indication as to why the subject should have sought out the arris or even that they understood what the concept meant. A neurophysiologist commenting on the same picture merely remarked that the fixation loci were at points of abrupt luminance changes (Hubel 1995: 80). It is a statement which is not completely true. The arris is not only a feature of numerous man-made objects like boxes and buildings, it is also an important form of scan director employed in certain styles of picture making, but not in all.

Some indication emerges that these readily anticipated results were fundamental to the perceptual process when the experiments were repeated with patients suffering from lesions to visually significant parts of the brain (Yarbus et al. 1968). However, apart from the fact that the experiments were carried out in Moscow where a slightly different genetic pool might be expected to be available to the one accessed by the draughtspersons working in north-western Europe, there is no indication of any attempt to discover whether any racial differences existed and it is difficult to see how any could be devised which would be valid. The fundamental nature of the processes observed is effectively only an assumption.

Boundaries are the first visual features discriminated by cats and monkeys (Hubel 1995: 69-71). Their reconstructed equivalents, outlines, are the first things students try to establish. When faced with a problem of representation which was different from any they had previously attempted, they all began by trying to see whether an outline would suffice as an answer, irrespective of their social or geographical origins. Some problems could be solved but with many others it soon became obvious that information which was missing from their solution was essential to the function to which they intended to apply the drawing. Most of them would then try either to devise or to discover systems of marks which would direct the eyes in the necessary ways. Some of them, optimistically hoping that a piece of elegant calligraphy would suffice or that some later stage in the design process would reveal what was needed, wasted a great deal of the time available to them. Practically all eventually found a system which achieved the desired result in others as well as themselves.

Nevertheless, it can be concluded from these results that in order to convey meaning, to depict what the designer has seen, a drawing, a painting, a sculpture or indeed any other form of visual reproduction of reality, has, as is evident from Yarbus's illustrations, to provide instructions which induce the people looking at it to recapitulate the eye movements of the initial perception. The marks comprising a picture direct the eye. The lines, the edges of patches of colour and the relative intensities of the colour move it round the image in such a way, that, if the movement is managed well, the spectator will be able to see what interested the person who made the drawing: the same solids and voids in the same relationships.

When scanning anything, a starting point is necessary. In the absence of anything special to attract attention, students educated in English schools tend to try and establish a rectangular frame and start to scan it at top left. This of course is not universal. Those habituated to reading Arabic texts will start at top right, a tendency which produces some very interesting photographs among students whose education has previously centred on Koranic studies. These start points are, however, by no means inherent in some racial wiring. European medieval fenestral stained glass designers invariably started the design at the centre of the lower edge of the window even when it was to be placed below eye level. Orientation marks must therefore be a necessary element of any visual design. Provided they are included, the scan can be followed through and the image interpreted as the designer intended. If they are absent the eye might well follow the scan the wrong way round and induce the wrong impact.

To summarise the process of drawing observed in the design studios, there are at least three stages. In the first something is noted by the person making the drawing and the features which are important to him or her are scanned sequentially, with some false trails that reduce in number with practice. Later, either in front of the model with portable tools or elsewhere with less mobile equipment, he or she edits out the non-productive scans and makes marks on top of or into a surface which are intended to recapitulate the essential features of that scan sequence. Finally, a viewer, initially the designer him or herself, but subsequently others for whom the representation is intended, attempt to follow the directions and recapitulate the original experience.

Palaeolithic parietal images from France and Iberia

Since it is not possible to watch Palaeolithic designers at work, one cannot be sure that any of the processes observable in the design studio were initiated in the caves. It is basically an assumption that they were but there are some confirmatory indications. The initial perceptual elements of Palaeolithic drawings are like the initial perceptions of a stretch of terrain of Yarbus's pictures of unexpected visitors or Hubels's cats. They are boundaries. They are reproduced by outlines, the essential marks which differentiate figure and ground. Since this is the initial and probably the most crucial procedure in the deconstructed perceptual process it is not surprising that it is the most heavily emphasised in the scanning instructions noted on the cave wall. Outlines can be formed in many ways: by sequences of engraved or painted lines, the edges of interlocking patches of pigment, by selection of natural fissures, undulations and discolorations of the rock surface and even by the way the light can be made to fall across a surface.

Standing in front of the large 'bison' in the shallow

cave of La Grèze in the north bluff of the Beune (Marquay, Dordogne) and reconstructing the visual cues presented is fraught with difficulties posed by what has occurred to it since it was made. As can be seen in Figure 3 it is now only engraved but might once have been coloured as well, as are some other drawings whose date of creation is probably similar. Each part of the outline is formed from multiple grooves, the result of repeated passes of an engraving tool or point scoring its way down into the rock surface and leaving behind a growing accumulation of micro-terraces with every pass. The whole outline is not continuous like that of a photographic outline of the European bull bison in Figure 4 but is broken up into sections and the careful study of the way in which these sections are built up provides a large amount of information about the way in which the eye is being directed.

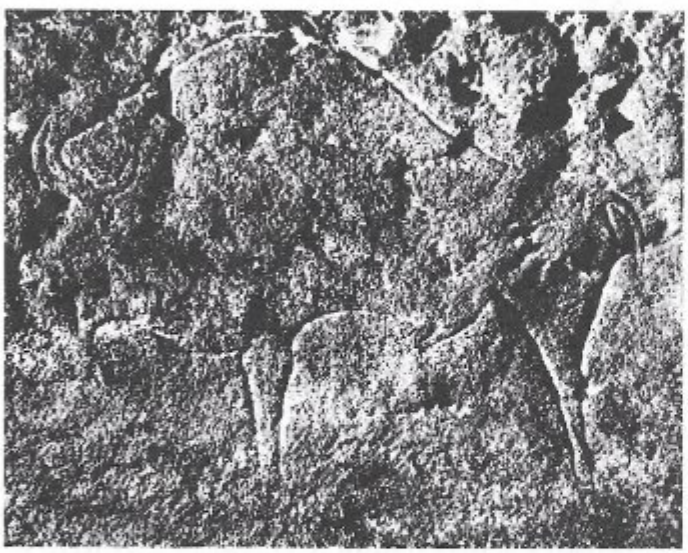

Figure 3. *The male engraved bison in the small cave of La Grèze, Marquay, Dordogne.*

Figure 4. *Modern representation of a male European bison, Bison bonasus, walking.*

Pairs of lines, in a series of directions, together build up a number of flat shapes which in Figure 5 can be seen to balance in the same way as the bison's masses of flesh. In all Palaeolithic caves the marks, either painted or engraved or often both, delineate several flat shapes stacked and spread like a hand of cards fanned out on a card table. It is the size in two dimensions and the orientation of the outlines which determine a shape's visual weight and the direction in which it is operating. A bit like two cards in a house of cards, shapes are made to balance one another.

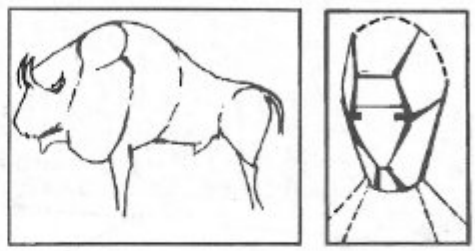

Figure 5. *Comparison between the directions for scanning contained in the drawing of the La Grèze 'bison' and the photograph of the woman's head used by Alfred Yarbus. Note that outlines of shapes can be approximately located on the dotted lines but that the subject scanned only arrises on the head and not the outlines.*

The directions contained in the drawing of the Palaeolithic 'bison' differ substantially from those in the scan of the head shown in Yarbus's second experiment, the photograph of the sultry girl. As has already been suggested, the photographer has constructed a head like a box by the way he has shone his lights. It has sides, front and arrises between them. The observer, whose scan was recorded, moved his or her eyes over all the important arrises of the box. The outlines of the shapes can be reconstructed but not with any precision. They are shown in the second diagram in Figure 5 as dotted lines, but the subject of the scan has not bothered to trace them out. At Ekain in Guipuzcoa, in northern Spain, light has similarly been used as a draughting tool but this time to create the outline of the back of another bison (Figure 6).

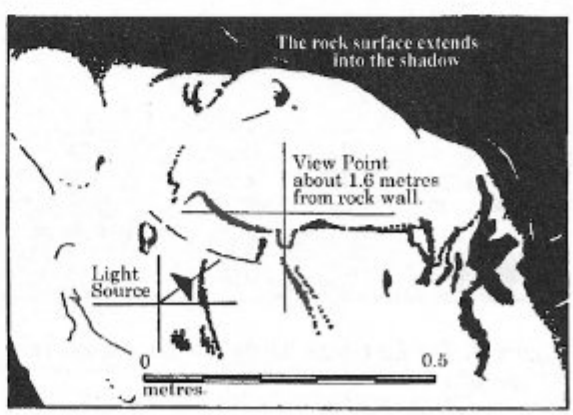

Figure 6. *'Bison', cave of Ekain, Deva, Guipuzcoa. A dorsal outline created by light.*

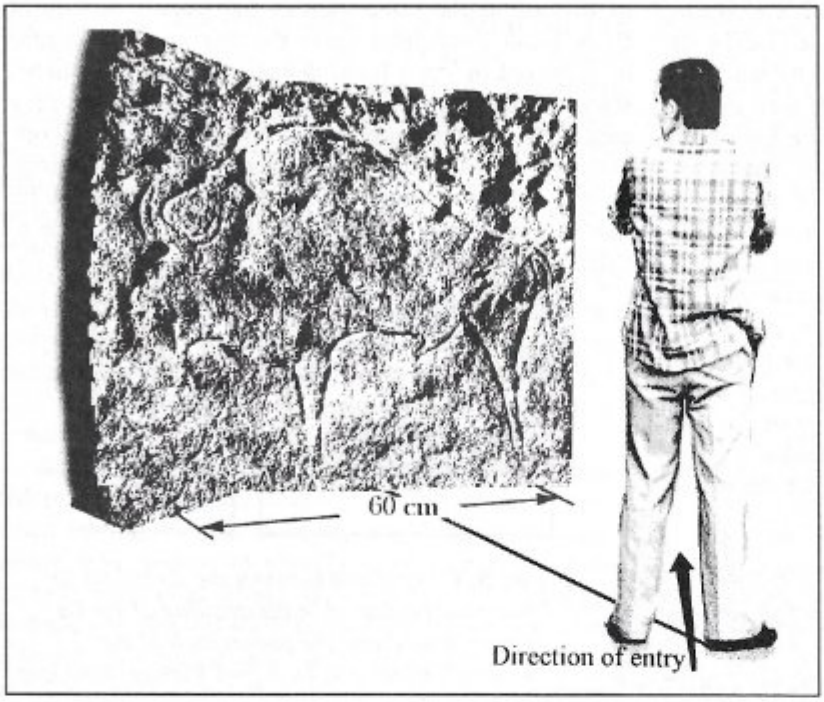

Figure 7. The approach to the La Grèze 'bison' and the scan start point.

The start point intended by the designer for beginning the scan of the La Grèze 'bison' is determined by the approach as can be seen in Figure 7. The long continuous humped line for the back and shoulders is the first to attract attention as the cave is entered and was probably the first grooved mark to be cut. Numerous other rock surfaces engraved during the Palaeolithic bear only this line, so, either spectators realised what was intended without need for more lines, or the draughtsman changed his mind and gave up the attempt to make an image after the first mark was made.

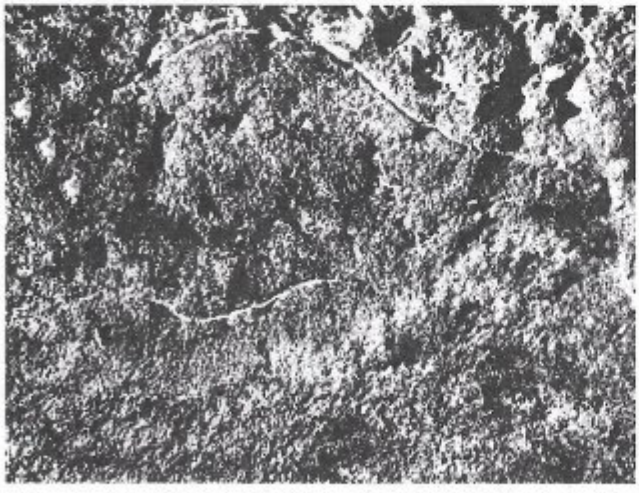

Figure 8. The La Grèze 'bison's' main component shape.

Once the dorsal line had been established the line of the dewlap and chest wall would have followed. The effective weight of the bull bison, the extent of its huge shoulders, is marked out on the cave wall between the dorsal and ventral lines. They make a large, almost rectangular shape poised on one corner and very nearly, but not quite, at its point of balance as can be seen in the drawing of the relative positions of the lines in Figure 8

The marks representing the foreleg break into the rectangular shape. There is a slight mark crossing the break which was probably done before the line of the dewlap and chest had been reinforced by repeated passes. At a later stage the tool has re-entered the groove delineating the rear part of the chest, deepened it and carried it round into the groove representing the back of the leg but the initial escape point is still visible higher up in the cutting sequence. The marks form a kind of fulcrum on which the mass of the shoulders can pivot like some almost square lollipop with the end of its stick in the ground.

On either side of the lollipop are two further sets of balancing shapes. To the left is the smaller, unsupported rectangular shape, defined by the deeply incised and complicated sequence of marks representing the horns, muzzle and beard. To the right, the lightly supported but heavier shapes of belly and rump extend over a greater area. As the whole outline is clearly intended to balance visually about the pivot of the forelegs with assistance from the propping back legs, the head had to have sufficient unsupported visual weight to act as a counterbalance. There are signs in the way the grooves were built up that the head was considerably enlarged to give the required extra weight during drawing and the outline was extended after the first grooves were cut, making the final result a rather confused arrangement.

Information about the balance of an animal is invariably of greater consequence in Palaeolithic images than information according with our notion of species. Slight changes in the direction of an outline may alter completely what a drawing can be called while altering the balance only slightly. Michel Lorblanchet (1995) has drawn attention to the outlines of the 'antelope' in Le Combel, Peche Merle (Cabrerets, Lot), in which uncertainty between several different types of animal exists. Three separate species can be seen in Figure 9 but there are at least eight distinct animals. The criteria for differentiating one animal from another which are being described are not really those derived from an understanding of speciation. Interest concerned with stance, with balance and with potential for action subsequent to being approached, is much more in evidence.

In any drawing some of the encapsulated instructions are obscure. Inefficiently placed marks, marks which turn the eye in the wrong direction, marks like the two at the top of the front edge of the foreleg of the La Grèze

bison, will not be the only cause of this. Erosion of surfaces, changes in the chemical constitution of pigments, dirt and other subsequent deposits of one sort or another will inevitably alter what can be seen and the changes will occur at different rates in different circumstances (Bednarik 1993, 1994).

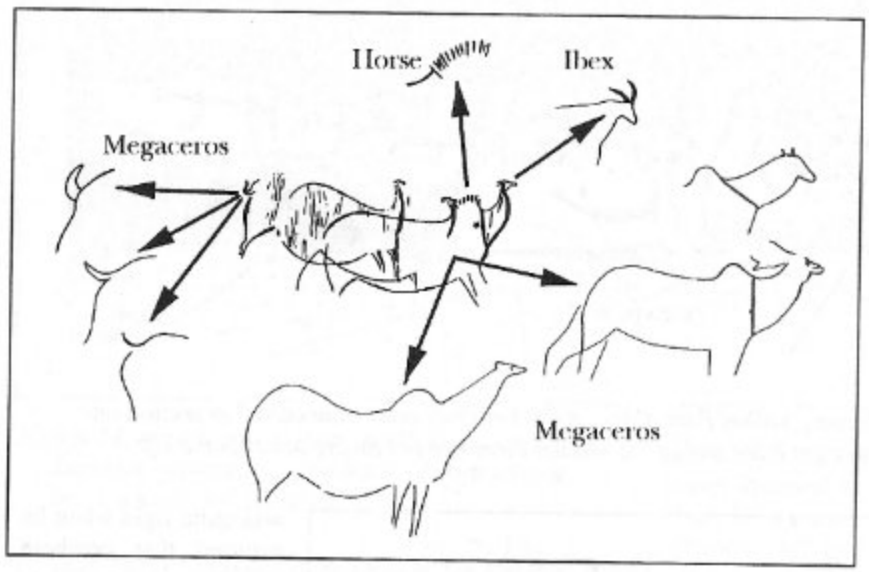

Figure 9. *The 'antelope', Pech Merle, Lot, as broken down into its component outlines by Michel Lorblanchet.*

The characteristic gestures which differentiate every designer's work from every other will also obscure his or her intention slightly. An individual's habitual co-ordination of hand and eye will always produce a slightly distinctive handwriting. Interestingly, there are very few quirks of outline that can be ascribed to the hand of a particular Palaeolithic man or woman. There is evidence of left hand-driven marks in some engravings. All the engraved lines in Colombier in the Ardèche appear to have been done left handed and in Gargas in the Pyrenees there are also a few (Breuil 1958; Barrière 1976). The engraving in the Camarin, reproduced in Figure 10, can only be seen by one person at a time and has to be lit with a lamp in the right hand, precluding right-handed use of the engraving tool. De Lumley (1968) and Appelaniz (1987) make very coherent if largely unsuccessful attempts to determine more detailed criteria for the determination of individual provenance.

In addition to the collections of marks which scan as a recognisable object, there are those which provide insufficient direction to associate them with a visible entity. Some of these may well have been representations of objects which for a variety of reasons are no longer familiar to us. The tectiforms illustrated in Figure 11, so called because they are roof shaped, from caves in the northern edge of the karst between the Beune and the Dordogne could be examples. Some of these 'forms' may be groupings of marks with esoteric associations as André Leroi Gourhan argued (1967: 513-51). He called them 'signs' but it is a word which prejudges the issue. These precise but unintelligible images might perhaps be better called 'cryptiforms'. They can only be glosses since their significance is less apparent than that of the representations they accompany. The period of time over which a given cryptiform continued in use and the limited distribution of any particular type make it unlikely that any meaning one of them might have had was central to the collective purpose of all the images at every location.

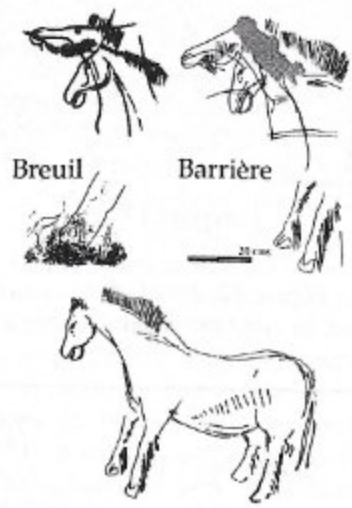

Figure 10. *The 'horse' with feathered hocks as drawn in left hand-held light by Henri Breuil (1955) and by Claude Barrière (1976), together with a drawing of its appearance in right hand-held light.*

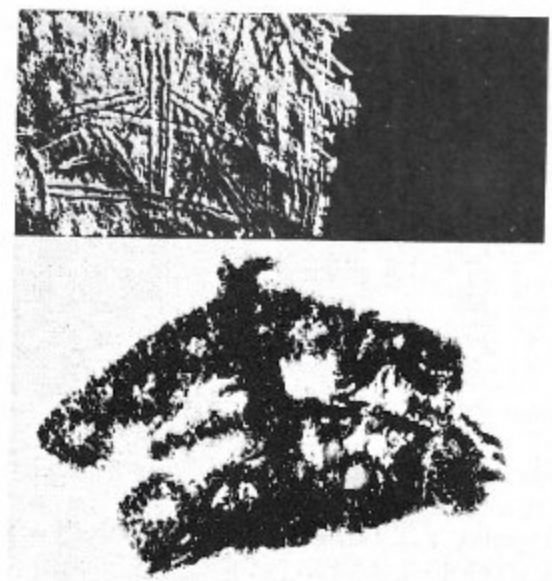

Figure 11. *Tectiforms from Font de Gaume, Les Eyzies and Bernifal, Meyrals, Dordogne.*

Representations are often placed close together. They often form a continuously interlocking group on the same piece of rock, while apparently suitable adjacent surfaces are bare of marks. Nevertheless, Henri Breuil

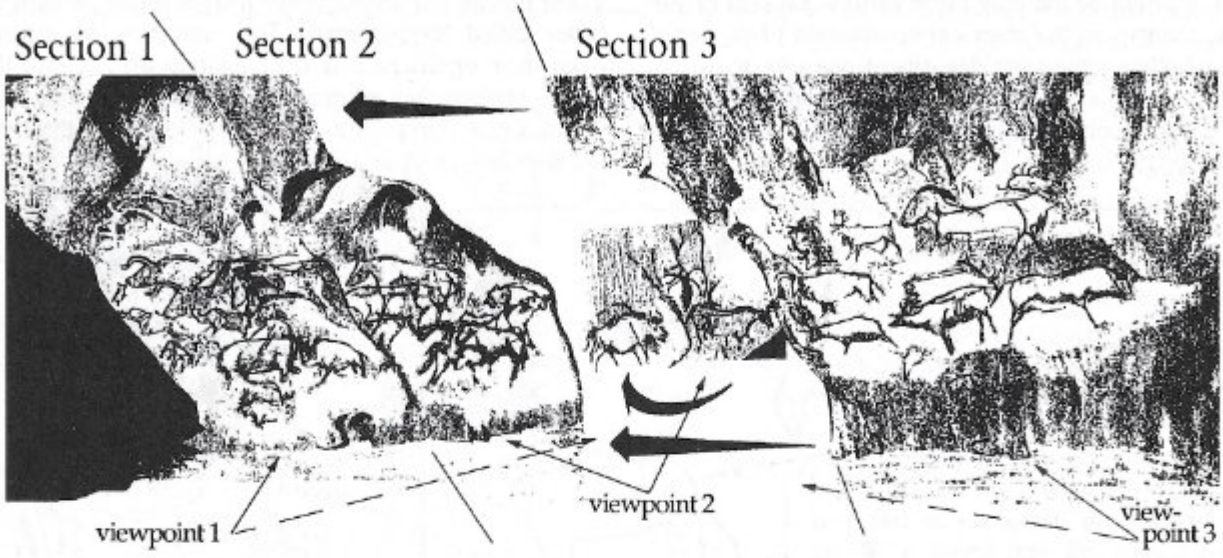

Figure 12. *Panel of the horses, Chauvet, Vallon Pont d'Arc, Ardèche. Only one 'rhinoceros' in section one and two animals at the extreme right hand end of the section three are not facing towards the left*

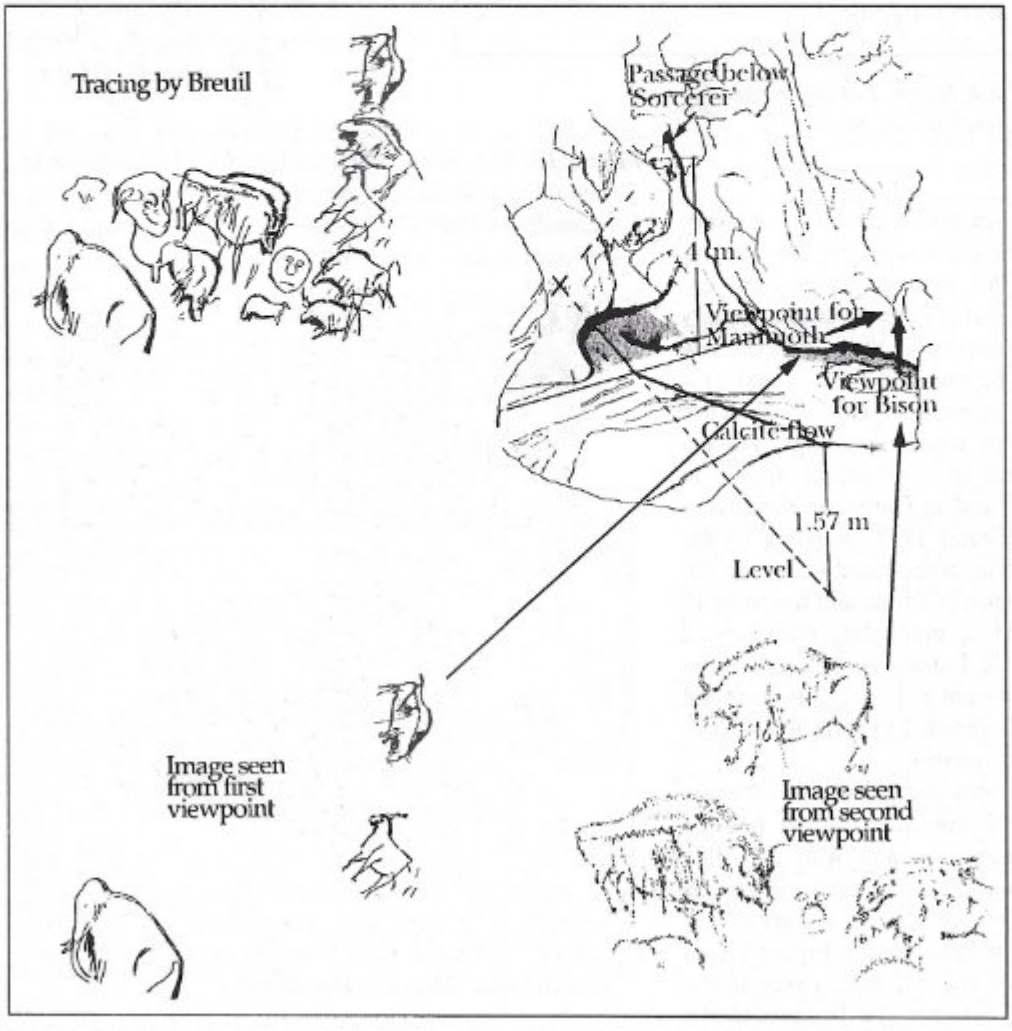

Figure 13. *The 'Sanctuary', Trois Frères. Two images seen on the same rock surface when moving into the cavity. The image photographed for Henri Breuil corresponds to the second of the two.*

was quite right when he asserted that nowhere are they obviously related to form a scene (1952: 67). In a very early painting in the Grotte Chauvet at the top of the Ardèche gorge surface, called the Panel of Horses, there is a co-ordinated direction of movement throughout the panel (Chauvet et al. 1995; Clottes et al. 1995). Provided allowance is made for the shape of the recess in the centre of the panel, all the animals, as in Figure 12, are seen to be facing to the left. So, despite the three distinct viewing positions, one for each of the three parts of the panel, the three distinct groupings of animals are co-ordinated. In Chabot at the lower end of the Ardèche gorge, and at Ekain, not far from the Cantabrian coast in Guipuzcoa, there are also similar arrangements of animals which have to be looked at from different viewing positions. In fact, balance which could lead to movement in a common direction is a frequent feature of collections

of representations which group across a cave void or along a cave wall.

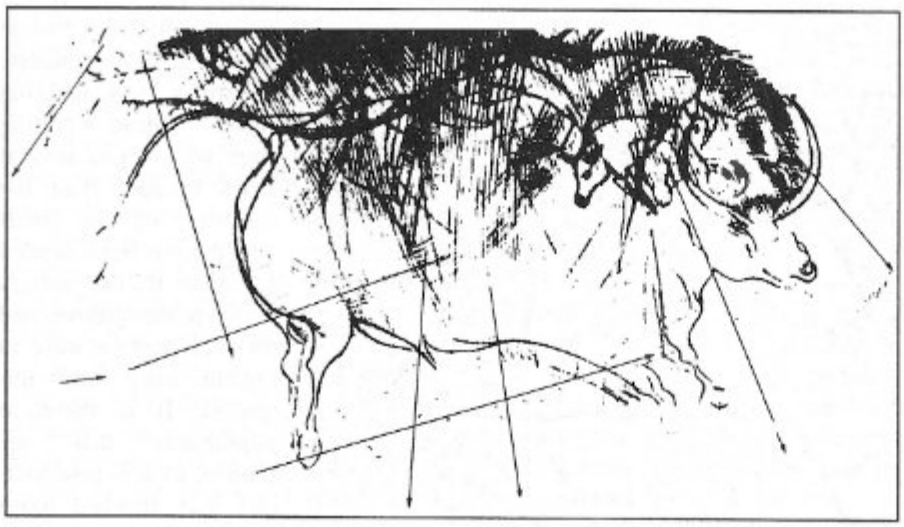

Figure 14. Bovid, panel on the north side of the Apse, Lascaux, Montignac, Dordogne, drawn after a tracing made by André Glory.

Direction of possible movement is not the only thing built into the scan sequences to associate more than one representation. The complex cavity known as the Sanctuary in Trois Frères, Figure 13, is so covered with engravings and paintings that tracings made from them by Henri Breuil are almost unintelligible and, more than half a century after he finished a very exacting and intensive study, fresh representations are still being found in the morass of lines. Disentangling them when standing in front of the rock surface is easier but quite precise spatial positions are required of the viewer. The lumps and hollows in the sloping calcite flow that forms the floor restrict not only the viewing positions from which the wall surfaces can be viewed, they also limit the number of people who can view it at any one time. Crouched in one position, one group of representations can be seen. Standing in another, quite close to the first an entirely different group is visible when virtually the same rock surface is scanned. The photograph taken for Henri Breuil in 1928 and called by him *Trois Frères, Sanctuaire petits bisons perigordiens et bouquetin gravé* (Bégouën and Breuil 1958: Pl. 15) shows precisely what can still be seen on the rock surface from a position a couple of metres distant. Max Bégouën commented in the mid-1970s that there had been erosion of at least one layer of patination through which the figures were originally cut since he had first seen it in 1914, but that the outline remained the same. None of the other figures Henri Breuil showed practically superimposed in his drawings of the wall can be seen. In a position about the same distance from the surface and about 80° further round to the left of the first position they are, however, visible.

Not all caves possess such convoluted surfaces that the viewing positions needed to see specific images group them automatically. The relatively smooth curve of the apse at Lascaux is covered with representations of bovids, deer and horses. Beneath the bovid shown in Figure 14, as in all the other animals in the apse, is a pattern of parallel striations. When the viewer takes up a position on the undulating surface forming the floor and wall of the apse in which the grid drawn under the animal on the wall is aligned vertically, the shapes imposed there balance in a way which gives the impression that it is properly orientated for viewing. Representations on adjacent non-vertical patterns are then to be ignored, until a position is found in which their grids can be seen with verticals perpendicular to horizontals. These marks may well have been imposed to serve some entirely different function but in Lascaux as in other cavities such as the 'Sanctuario' in La Pileta in the Serrania de Ronda, Malaga province, markings on the walls 'frame' the image, orientate it and indicate the best position and stance for viewing, thereby helping with the selection of a start point for the scan.

Figure 15. Two 'horses', Ribiera de Piscos, Côa valley.

Orientation marks and other indications of grouping are less apparent in the open air images on schist exposures in the Douro catchment arguably in a 'Palaeolithic style' (Zilhão 1995; Zilhão et al. 1996; Bahn 1995) than they are in the caves. A drawing like the equid in Figure 15 is developed from a characteristic dorsal line in exactly the same way as the La Grèze bison, indeed there is a second dorsal line in this petroglyph drawn so the horses appear to be touching muzzles but at other sites nearby there are fewer indications as to where to start a scan. The differences might stem from a change in intentions between the draughtspeople of the Pyrenean caves and those of the Douro rock exposures.

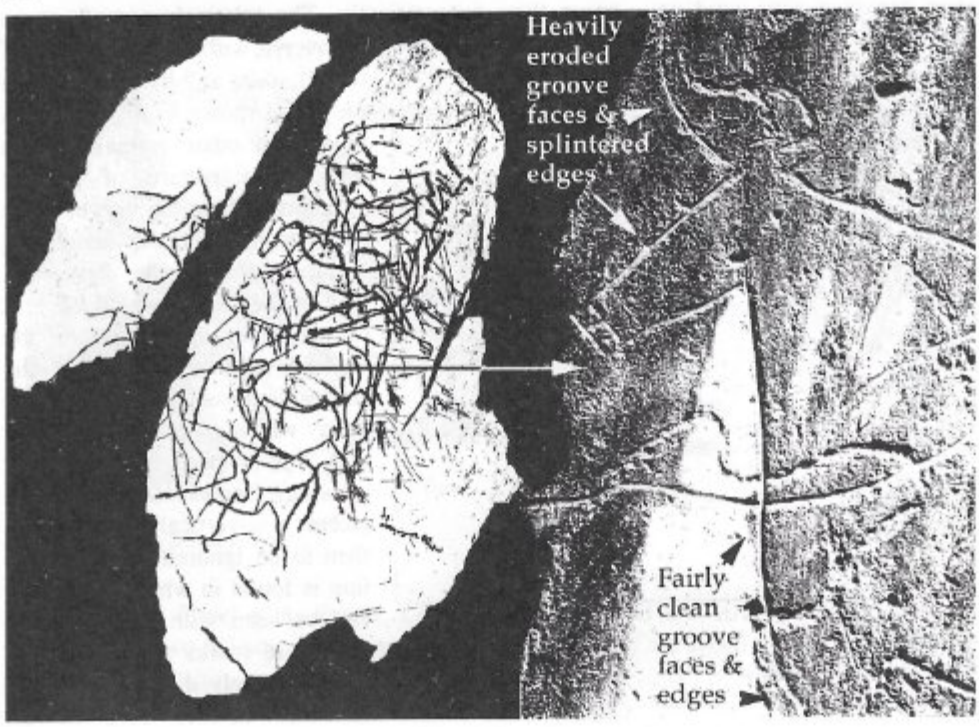

Figure 16. Large bovid, Penascosa, Côa valley.

In the Côa valley, renewals and replacements of images in the 'Upper Palaeolithic style' could have continued long after the end of the last Ice Age. Deep grooves outline a bovid body at Penascosa, dated by stylistic comparison of the horses head on which it is superimposed to the Magdalenian, Figure 16 (Zilhão et al. 1996). Cosmogenic chlorine isotope accumulations on the exposure surfaces are said to give a minimum exposure of the rock surface to weathering of around 135 000 ± 70 000 years (but see Bednarik 1998, concerning cosmogenic nuclide analysis). Though this is more than enough for any Upper Palaeolithic engraving to have been undertaken, chlorine as chlorides is readily transportable in vadose water solution through the fissures in the schist and this possibility creates an uncertain bias for every result of Phillips et al. (1997). The carbon isotope assessment of deposits within the grooves of the outline, though in considerable agreement with each other, are much lower and only suggest that up to 2000 and 3000 years have elapsed since the grooves were cut. There is, however, sufficient discussion of the bias in these figures to place a corrected date anywhere between the final stages of the last glaciation and the last few hundred years (Watchman 1995, 1996; Dorn 1997). Assessment of the microerosion of crystals arrives at a time lapse since the work was done, which is compatible with the higher limit of the carbon isotope figures but depends upon comparisons with curves from locations where environmental conditions differed from those in the Côa valley (Bednarik 1995).

In these circumstances, the fact that a portion of the outline of the dewlap and back was cut with a combination of sharpness of edge and a narrowness of Vee is to be noted. It would have been difficult to cut into a hard metamorphosed rock like the schist. The groove surface has been visibly eroded implying some antiquity. Nevertheless, a carbon steel lettering chisel whose cutting edge was forged several times broader than the diameter of the shaft would have been needed for this if the arrises between the groove and the rock surface were to remain crisp and unspalled. It is therefore improbable that the groove, as it is now visible, was finished more than two millennia ago — even if it *was* begun twelve or fourteen millennia before.

The uniformity of the collection of scanning instructions attributable to Upper Palaeolithic parietal cave images implies that, for whatever reason, the preoccupations of the draughtsmen encapsulating them in the marks on the cave walls were also uniform. Small groups of animals were depicted with great clarity so that anyone could recognise them. They were placed singly or on spatially separated rock surfaces in such a way that the real space between the representations became a factor in the perception. In so far as they can be recognised, the small number of species represented in any one cave, chosen from amongst the immense diversity of large mammals and birds present in the western Subarctic during the late Pleistocene, show that the outlines were selected discriminately and must represent animals of particular significance. Finally, though the drawings were not particularly species determinate, they were very representative of potential movement.

Two interpretations of this selection are possible. The animals might well be represented for purely social reasons, because of some religious or other transcendental reference. Alternatively they could simply be representations of some aspect of the environment. The two interpretations are not completely distinct. Aspects of the environment can have transcendent associations. Nevertheless, the two interpretations are to some extent polar.

Most arguments, which assume that a transcendental significance explains the French and Spanish parietal images, rely heavily upon recognition of the signification of the associations of marks which are not visually interpretable (Leroi-Gourhan 1967). Since, as has already been pointed out, there is no reason to suppose that the significance of these obscure collections of marks would be retained in memory longer by Palaeolithic humans than they have been by their modern descendants, it

must be the interpretable representations which originally supported the core of meaning in the images rather than the obscure ones. There are certainly some representations which suggest a transcendental reference. The object that looks like a totem pole in the shaft at Lascaux is one such; but by far the largest number of groupings of images and solitary images do not.

Groups of marks almost invariably scan as though they were intended to be interpreted as parties of animals. Naber et al. (1976) provides a summary of the published identifications from a sample of 202 cave sites in France and Spain believed to contain parietal images done during the Palaeolithic. The numbers are approximations based on a consensus among the prehistorians cited: 161 of the sites contain representations recognisable as herbivores, 79 have animals recognisable as predators other than human beings, 81 have representations recognisable as a part or a whole of an anthropomorph and 62, at a generous estimate, have cryptiforms with the sort of clearly defined outlines whose reference is not obviously to an animal of any kind. All of the sites contain marks that are almost certainly the product of human activity but are otherwise unintelligible, but only 50 contain all the recognisable types of arrangements of marks. On this basis it has to be assumed that any transcendental element is of minor importance in comparison with statements about animals.

The most obvious use to which representations of the animals in their environment might be put by a hunting and gathering or foraging community is in recording some aspect of the search for resources. It is frequently pointed out, however, that the numbers and types of beasts recorded on the cave walls are not consistent with bone recoveries from excavated occupation sites (Combier et al. 1958; Altuna 1972, 1983; Rice and Paterson 1985, 1986). Large numbers of mammoth and a smaller number of rhinoceros are represented on the walls of caves in the Ardèche gorge for instance. One mammoth molar has so far been found during excavations of an occupation site, at Oulens in a side valley of the gorge (Martin 1949), but no rhinoceros remains have been found. The nearest mammoth skeletons discovered are probably those excavated by Jules Ollier de Marichard (1869) at Lassalle in the Gard. The site was reported in 1869 and is on limestone some ninety kilometres south-west of the Ardèche caves. It is therefore difficult to see how either of the types of pachyderm represented in the Ardèche caves could have been a major food or other resource to the people frequenting the place, even though mammoth fulfilled that function in Russia and eastern Europe at the time.

The presence of mammoth and rhinoceros on the cave walls, alongside other animals which from the quantity of remains at occupation sites must have formed a much more important resource, implies that not all the environmental information carried by the cave walls was directly concerned with economic return. Owl bones are recovered in considerable quantities at some French Palaeolithic sites but none so far have been discovered in the Ardèche region (Eastham 1998). The eagle owl, apparently represented in Chauvet, could well be significant for the way the people using the cave exploited their surroundings, without anyone necessarily making an attempt to take it as a resource in that area. Owls make quite distinctive calls at specific times of year. The appearance of large pachyderms in a particular locality might well presage or terminate some seasonal, periodic, climatic or other type of occasional event, which would have been of importance to people living there at the time.

Discussion

The view has been taken throughout the foregoing analysis of picture-making activities that the idea expounded by a drawing is introduced and regulated by directions built into it which summarise voluntary eye movements made by the designer. They are made while trying to understand which aspects of the thing he or she is scanning are of interest and should be represented. In the individual representations within the Franco-Iberian caves, these directions are invariably the outline of a flat shape. The frequency of repetition of characteristic changes in direction along the outline establishes the precision of information that was being transmitted. Precision of outline and clarity of scan instructions was seldom sacrificed to other considerations. It was even present, though perhaps to a slightly reduced extent, in the cryptiforms such as the roof- or tent-like tectiforms.

The way the shapes outlined have been disposed across the surface of the support and related to one another serves admirably in describing the poise, the physical balance of masses of the animal represented, but very little else. The difficulties evident in the literature in recognising a drawing as representing one species of animal rather than another are inevitable. Species differences are not what the viewer was being directed to see.

Groups of Palaeolithic people clearly required exact information about animals but little else in their world is indicated. The presence of human beings, sometimes disguised, amongst the animals is occasionally recorded. In addition, there are one or two other entities represented as cryptiforms which apparently everyone understood so well or were so unimportant that there was no need to do more than hint at them. Apart from these additional notations it is primarily information about animal balance and posture that is being passed to a viewer.

The efforts of the contemporary students seldom involve quite as much intensity of mark differentiation throughout as was required of a Palaeolithic draughtsman. It therefore follows that the ideas incorporated in the Palaeolithic images are not particularly esoteric, do not involve much prior understanding, and can therefore be effective at transmitting information to relative strangers.

A more functional understanding of the Palaeolithic image can be discovered in the way its elements are assembled and presented. In Franco-Iberian cave images,

all the distances between elements are real distances. They are either actual distances across the support or actual distances across the voids between supports. Like the representations themselves, they are undoubtedly uniformly scaled down. A distance between two small drawn representations represents a much larger real distance than a distance of the same dimensions between two larger representations.

No explanatory ethnology can exist for the work of the Palaeolithic designer to the extent it can exist for the work of the student in the studio, so it is only their scan sequences which are available for interpretation. They indicate that the images describe situations which contribute to an understanding of the behaviour of beasts in a particular environment, while they are going about their own concerns and before they are attacked. They probably presage the actual activity and anticipate a satisfactory outcome to foraging. The depictions of predators are of course necessary as a reminder of jeopardies. The interesting thing is that the requirement for storing and passing this form of information to others survived for so long in European foraging communities. If the evidence from the Douro catchment in Portugal is to be believed, it survived throughout pre-History and into Historical times. There must have been a compulsive need for its existence which elsewhere disappeared, where herding and cultivation became more important in resource collection.

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COMMENTS

To see is not to look: Comment on Eastham

By JOHN L. BRADSHAW

Eastham's interesting hypothesis rests on a series of assumptions:

1. [The artist seeks] to make notations which enable others to reconstruct them;
2. The marks [are] made to guide an observer through [a representation's] reconstruction;
3. The Palaeolithic designers intended their images to be understood by others . . . the pictures were not simply done for self-gratification . . . [or were] frivolous . . . [they] have an intentionality;
4. [They are] mimetic pictures intended . . . as communications between people;
5. Eye movement scanning the whole, and the determination of an order of movement of the eye . . . is an essential activity of perception;
6. The important [eye] movements are larger, voluntary, and directed by the desire to understand the nature of what is being projected on the retina;
7. Movement and shape cannot both be seen at the same time;
8. A painting . . . has to provide instructions . . . to recapitulate the eye movements of the initial perception . . . Orientation marks are therefore a necessary element . . . provided they are included, the scan can be followed through and the image interpreted as the designer intended.

To take Nos 3 and 4 first: we don't *know* the artist's original intent. It may not have been communicative, but may have been purely expressive, an aesthetic act, non-representational even in intent, like the (as then uninvented) abstract art of the 20th century. Doodling and some graffiti come under this heading.

To take No. 5: eye movements are not essential for the interpretation of quite complex images. Tachistoscopic (less than 150 msec exposure) presentations are commonly employed by visual scientists to 'paint' information on a specified (typically peripheral) retinal region. What fixational (saccadic) eye movements in the observer *do* reflect is the direction of overt (and by implication covert) attentional processes. These are not always voluntary (*pace* No. 6); indeed, the distinction between voluntary and involuntary at the level of attention is often blurred.

To take Nos 1, 2, 8: photographs are veridical representations, with *no* information to guide the initiation or execution of eye movements, yet they are very readily interpretable. If a photograph (or any representation other than a line drawing) is digitised and subjected to high-frequency bandpass filtering (to eliminate the low-information spatial frequencies where there are no transitions, edges or boundaries), a 'line drawing' *automatically* emerges. An algorithm to elongate or shorten certain such lines (on the basis of present length or position) will then *automatically* generate even a *caricature*. No human (artistic) intervention whatsoever is necessary, by scan paths or otherwise. In fact 'selection of a start point for a scan' (p. 105) may only be helpful in a time series, as with sequential cartoon frames.

To take No. 7: there are separate perceptual channels for form, colour and motion; lesion studies show how they can dissociate and depart from the normal pattern of simultaneous apprehension.

Some minor points: we must not down-play the importance of peripheral vision in *automatically* guiding saccadic (foveal) fixations upon high-information (high spatial frequency) areas. Macular degeneration, moreover, still permits considerable peripheral processing — indeed scotopic (low illumination level) sensitivity is *highest* in the periphery (rod vision).

I hope these comments, meant constructively, can form the basis for a discussion of Eastham's interesting hypothesis.

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Do the eye movements suffice?

By J. B. DERĘGOWSKI

At the core of Mr Eastham's paper is the notion that the viewer of a picture retraces the perceptual experience of the artist, and that he does so by following the path of eye movements previously followed by the artist. It is the artist's task, therefore, to depict a model in such a manner that the portrayal provides the eye with appropriate guidance as to how it should move. A set of beacons needs to be created, at each of which the viewer is furnished with two distinct quanta of visual information, one pertaining to the nature of that part of the portrayal which is then markedly visible (as determined by the differential acuities of the retina), and the other directing the eye to the next point of ocular arrest, the next beacon. The eye is thus sent travelling over the scene, real or depicted, like a football being passed from one to another by a group of stationary players, and in so doing the eye gathers information about the scene.

This interesting suggestion is not, unfortunately, supported by a body of empirical evidence. It is, rather, a speculative exercise which raises a number of issues, three of which are addressed below. The three issues are:

1. The relationship between the eye movements and the texture gradients;
2. The role of salient contours on the surfaces of objects; the 'dorsal line' effect;
3. The origin of 'bizarre' artistic styles.

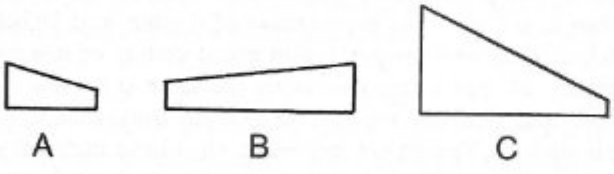

Figure 1.

(1) Figure 1 shows three shapes. If these shapes were cut out of the page they could be so arranged in space that their retinal projections would be identical. This would be achieved by setting shape A in the observer's fronto-parallel plane, shape B in the vertical plane inclined at 45 degrees to the fronto-parallel plane, and shape C in the vertical plane inclined at 315 degrees to the fronto-parallel plane. The itineraries of the eye directed by the shape of the retinal projections would, the article implies, be identical, and hence the shapes would not be distinguishable, nor would it be possible to depict them as distinct shapes in different spatial orientations. This, however, is not so. Notwithstanding the geometrical congruence of the retinal shapes, the Eye (capital E is used to indicate that the term describes the visual system, not merely the orb) would be able to distinguish among the lamellar shapes and the artist would be able to depict them in such a manner as to retain this distinction. These feats would largely rely on a feature of the environment which is entirely omitted from the author's consideration, namely the texture gradient (Gibson 1952). It is possible that this characteristic of the visual world can be encoded in the terms of eye movements, but the author offers no suggestion how this can be done.

(2) Gibson has also pointed out that an abrupt change of the texture gradient is generally associated with a sudden change of the shape of the surface and therefore with an arris. Figure 2b demonstrates this cogently; the faces of the depicted cube are distinguished solely by means of difference in texture gradients. Since texture gradients define ridges on surfaces it is parsimonious to assume that the dorsal lines to which the author refers are thus established. There seems, in the present context, to be no readily apparent justification for this dismissal of Gibsonian notions, especially as no alternative mechanism for the detection of the dorsal lines is put forward.

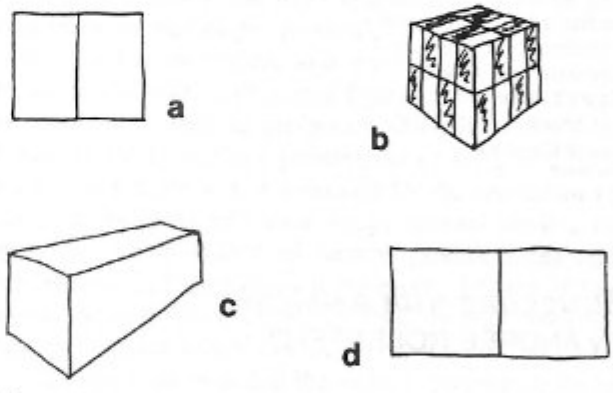

Figure 2.

(3) The author suggests that the shape of the constellation of the points of arrest defines both the shape of the artist's model and of its portrayal. Different constellations define either different models, or the same models in different orientations. Thus in Figure 2 both (a) and (b) are derived from the same model (a cube) in different orientations, but (c) and (d) derive from two distinct and different models, possibly from two parallelepipeds.

It is well established that occasionally cubes are drawn as shown in figure (d). Such drawings have been obtained from both children and adults (see e.g. Bartel 1958; Chen and Cook 1984). In these drawings the artist has combined two distinct views of the model, two views that are spatially incompatible because they could only be obtained by viewing the model from two different stances. The same phenomenon is present in the photograph of the La Grèze bison illustrating the paper. The horns of the animal are shown as if it were seen from the front, the rest of the animal is in the lateral view. No

reference to this phenomenon is made in the paper, although it is a characteristic feature of several established styles, for example of Ancient Egyptian wall decorations (Michałowski 1969). The phenomenon is of importance as it suggests that some other factor than the eye movement has influenced the process of depiction and suggests that this factor derives from the shape of the depicted object. It is difficult to conceive how a picture made in this style can cause the eye of the viewer to retrace the experiences of the artist's eye. Australian rock art, too, provides a striking example of this usage. It is the Kakadu crocodile, an unfortunate beast whose head, body and tail are strangely twisted relative to each other (Deręgowski 1995). Another 'bizarre' usage comes from African rock art. The usage is widespread (it is found in Namibia as well as in the Sahara) and involves depictions of giraffes. These are portrayed as 'sitting giraffes'. It has been suggested (Deręgowski and Berger 1997) that this is a consequence of the shape of the animal, notably of its long sloping neck.

Whatever the causes of the 'bizarre' distortions they have either, if Mr Eastham's speculations are valid, to be explained in terms of eye movements or reason for inappropriateness of such an explanation must be offered.

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Struggling with ambiguity

By ANDRÉE ROSENFELD

With his long experience as an art teacher (in the Western tradition) Eastham is well placed to attempt an analysis of the process of object perception and its translation into image, and his application of this process to imagery in Palaeolithic art is therefore of interest. Much previous research on Palaeolithic imagery has concentrated on species identification, and considerations of the process of image construction have tended to focus on technical rather than perceptual aspects (but see Lorblanchet [1982: 33ff] for an analysis of image construction for the Frieze Noire at Pech Merle). Researchers have long struggled with the ambiguity inherent in many Palaeolithic images and Lorblanchet's (1989) insightful study concluded that — in some cases at least — such ambiguity is intentional, and hence presumably meaningful. Eastham's conclusion on the other hand is that species identification of Palaeolithic animal images is inevitably fraught with ambiguous results because of the very processes of image construction, and this implies — though he does not specifically state it — that Palaeolithic people viewed these animals and the images in a way significantly different from ourselves. Not surprising, but the difference can be instructive.

The paper opens with a rather obvious statement that the 'Visual transmission of ideas . . . depends . . . on the processes of visual perception'. However, ideas clearly not need have visual reality, and in any case much visual information is not iconic. Eastham here restricts himself to considerations of iconic imagery and its overt significance, i.e. the physical identity of the thing (animal) represented. Even at this level, the transmission of information depends on the translation from perception of a model into marks that enable its *conceptual* reconstruction. And since the construction of iconic imagery is of necessity a translation from signified to signifier (and in the case of paintings or drawings from 3D to 2D), it will inevitably be mediated by culturally construed conventions which may, and often do, result in images that differ significantly from close visual similarity without loss of meaning.

The use of a high degree of visual congruence between the retinal images of model and of its sign, shared as it happens by some Western and Palaeolithic art, is by no means universally obvious in its ability to convey meaning, some traditions preferring a more intellectually based conveyance of information (e.g. Hudson 1960; Layton 1974). However, since much Palaeolithic art does (appear) to aim at visual congruence, Eastham's observations on the physiology of perception and its translation into visual schema in our own tradition of realism are pertinent. The paper does however suffer from insufficient distinction between the processes of image construction and of image decoding. This is relevant since the construction and decoding of the images under consideration takes place in significantly different cultural situations. Eastham points out that a viewer's interest will interfere in some aspects of visual perception, and hence in image construction, but he does not explicitly consider its operation in image viewing, suggesting instead that the image will of necessity direct the perceptive process. This requires stronger substantiation than is offered. The experiments of Yarbus and Hubel (cited) deal with the perception and decoding of images made and seen within essentially the same cultural context, and similarly the diverse cultural backgrounds of his students, though not irrelevant, must have included a strong Western influence if they were to succeed in a Western educational system. While we may safely assume identical physiological processes of perception among all modern *H. sapiens* the selective aspects of focus and interpretative decoding of images must presumably also be subject to viewer interest — i.e. cultural context.

Two physiological aspects of perception are of particular relevance: one is the observation that viewing relies on constant movement of the eye, i.e. a twofold scanning process, one involuntary and the other voluntary and selective, hence, as Eastham states, determined by the relevance concepts of the viewer. The other is the importance of 'boundaries' as the eye's mechanism for

image perception, particularly boundaries of luminosity (and colour). Hence the 'outline' of body/attribute mass as selected is a widely used convention in animal depiction. These are not new observations, but (if I have understood Eastham's proposal correctly) he further argues that, when making iconic images from a model, the sequence and positioning of marks that construct the image reflect the initial scanning process of the artist — voluntary or involuntary, or both? (I must assume here that Eastham believes that drawings in caves were made 'from memory' i.e. from a vivid mental image of the creatures and not from actual animals!). This observation leads to the possibility of reconstructing how the artist viewed his/her model — *provided* that in viewing these images we can search out a starting point and follow the sequence of the drawing process, and thus follow the artist's original scanning sequence. While Eastham implies that this process is inevitable in the very process of viewing — 'the marks comprising a picture direct the eye' — his discussion of a number of Palaeolithic images, in fact, relies on a highly conscious and analytical process, viewing them with an explicit interest in image construction, rather than as many previous researchers with an explicit interest in other matters: species, technique, stylistic criteria etc. This is not to detract from his analysis — on the contrary it provides a novel and interesting perspective on Palaeolithic draftsmanship.

He makes a number of observations from this analytical process, notably a pervasive emphasis on balance and movement in animal images; and he suggests criteria for the identification of intentionally grouped images based on the position of the viewer. Despite his identification of intentional groupings, he reiterates Breuil's' observations about the lack of 'scenes' in the art. While this remains true in the realism sense of 'scenic' depiction, scenes indicating relational meanings between images may be temporal rather than spatial, e.g. as in east Arnhem Land bark paintings — or indeed some of the Futurist school of European art; or they may be symbolic. The sense of movement which Eastham identifies as characteristic of Palaeolithic images and groups might in fact be a clue to the temporality encoded in some of these 'scenes'. More telling is his observation that the artist's emphasis in image structure generally lies not in conveying species-specific information, but on a selection and positioning of body masses that denote balance and posture of the animal. He may have overgeneralised, for many Magdalenian images do seem to contain very detailed species-specific anatomical information. However, other images do not. Even so, I cannot follow why this necessarily precludes more than functional levels of meaning in the images. After all, the Aboriginal Dreamtime is populated (and illustrated) by animals behaving as animals as well as being ancestral creative forces of transcendental significance. I do not believe that the rationale for Palaeolithic animal imagery is finally resolved by this analysis. Furthermore, if information on balance and posture of an animal image was to be meaningful, the species denoted must also have been identifiable to Palaeolithic viewers, thus implying that specific identity relied on clues other than the visual information that we recognise as diagnostic. These could comprise a combination of factors such as context, location, oral tradition, naming etc. or even posture itself. Reliance on non-visual clues to complement the meaning of images is of course not unusual, but it has rarely been entertained in studies on this body of material.

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Viewpoints and movement in parietal art

By ANN SIEVEKING

Michael Eastham states, basing his proposition on modern laboratory experiments, that movement and shape cannot be seen simultaneously — outlines are 'the initial and probably the most crucial procedure in the deconstructed perceptual process', that is, in the two-dimensional transcription, and we observe that in the Palaeolithic depiction of animal figures it is shape that is recorded, apparently in preference to movement. Shape is established by outlines painted, cut or suggested by a natural rock form and is solidified by the recreation of mass, in the form of colour wash, striated shading or again, in the utilisation of natural protuberances and depressions. In Palaeolithic art the essential shape of any animal is very effectively established, usually by a reduction to characteristic essentials.

Eastham comments that the animal representations in caves are often grouped, but that they do not illustrate a scene, or at least not a scene that we recognise as such; he adds, however, that a change in the position of the viewer can give coherence and direction to a panel or frieze of figures, for example the horses at Ekain or at Chauvet. The viewing point is very important in parietal decoration. In the matter of detail, that is with regard to a single figure, many animals are only anatomically correct when seen from a particular position. For example, one bison in Bédeilhac (Ariège) is distorted in length if you look at it from a central position, or in a published transcription, and only appears both complete and in proportion from a single lateral viewpoint (Beltrán et al. 1967). A number of the bison in Niaux (Ariège), as Leroi-Gourhan pointed out, are depicted from a position that is low with regard to the stature of a man, with the far hind and forelegs visible and drawn below the near, whereas from a level (standing) position neither the stomach nor the top of the offside foreleg of such an animal would be in sight.

In general, Eastham considers that the direction of

possible movement is built into the scan sequence by virtue of the position of the viewer, but movement can also be given to these 'static' figures by the manipulation of light. As Ruspoli noted in his study of Lascaux (1987), moving a light can create a suggestion of movement. In recording Lascaux his cameramen were restricted to low and intermittent lighting and, in his description, the frieze of animals unfolded before the viewer, some figures receded, others emerged, some could only be seen from a succession of shifted positions and the turned heads and raised legs became, not incidental fixed images, but important to the presentation of the figures. We now have no experience of this animation, which is not apparent with fixed lighting, or in still photographs. Movement, however, is a more important part of Palaeolithic art than at first appears; in caves it is true most figures are standing, in profile, and the use of duplicated outlines to create the illusion of trotting or walking is rare. However, in the decoration of engraved plaquettes this trick, whereby one figure is given many legs in a variety of positions, or many heads to indicate racing or browsing, is more common. On occasion actual movement is also illustrated on plaquettes; one may cite, for example, the groups of reindeer from Limeuil (Dordogne) or the galloping horses from Paloma (Asturias). In the context of plaquettes a moving light or a changed viewpoint are either less or not at all effective, and the suggestion of movement has to be included in the engraving as it cannot be added later by other means, as it can be in caves.

The viewpoint in caves is important, not only with regard to single figures, or panels of figures seen at close range, but also on a more distant scale. Lorblanchet's (1992) work at Pech-Merle, Lot, demonstrated that certain images have been placed to be seen to their best advantage from particular stand points. One such is the panel of spotted horses which is best seen from the lateral walkway at a higher level on the far side of the gallery. The impact today, with all the galleries illuminated, is not so dramatic but when the panel is spot-lit, in a dark cave, the effect is spectacular.

To travel from these considerations of distribution, movement and lighting to a consideration of meaning is a step in the dark. As Eastham states, the presentation of animals (the scanning instructions) is uniform and effective. We, like (we assume) the artist's contemporaries, have no problem in recognising the limited species shown (Sieveking 1997). Eastham regards this animal repertory as of paramount importance and supports the interpretation that this is a hunting art for a hunting people. 'They [the images] probably presage the actual activity and anticipate a satisfactory outcome to foraging', but comestible animals are only a part of the story. The abstract signs Eastham refers to as obscure, stating that 'there is no reason to suppose that the significance of these obscure collections of marks would be retained in memory longer by Palaeolithic humans than they have been by their modern descendants', but this dismissal most probably misrepresents the situation. They are obscure to us, but we cannot assume they were incomprehensible to their original viewers. In this context we have no conception of what we are looking at, or what we are looking for. Some 'signs' (collections of marks) are apparently simple, others are complicated and sophisticated. Leroi-Gourhan (1979a), commenting upon a series of disjunctive signs at Lascaux which are based upon a star, or diagonal cross pattern, continuously differentiated by the omission, elongation, or interruption of one or another line, stated that 'it is evident that such a scheme implies one is in the presence of a veritable code, the sense of which continues to escape us although its existence is not in doubt'. If the Palaeolithic animal figures are the first mimetic images, the 'signs', both simple and complex, may be regarded as the precursors of notational communication and, as such, only a degree less explicable than the entire repertoire of Palaeolithic art.

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REPLY

Verification, alternative graphic procedures, social interference and cryptiforms: four responses

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All four commentators have dealt in a very positive and useful fashion with what I have said. I am grateful to them all for their reflections. There are few points which are irreconcilable with the tenor of my remarks and it seems to me that their chief effect is to extend and amplify.

John Bradshaw's suggestion that glances of very short duration could be involved in both the creation and perception of pictorial images is perhaps the most challenging he makes. Tachistoscopic perceptions which are too brief for any voluntary saccadic movement to be generated are not obviously a particularly frequent source of stimuli in Palaeolithic pictorial images or indeed in any other visual image making. Why this is so is clearly a critical question. Very rapid exposure to visual stimuli often generates sufficient accurate outline information for recognition of the source of the stimuli to occur, but it is equally likely to induce the appearance of unhelpful perceptions like fairies, flying saucers or nasty things in the woodshed. Time for saccadic exploration is essential if any certainty is to be achieved. But as memory is always involved, even while drawing from a seated model in a life studio, it is not perhaps entirely clear

whether there is a necessary difference between the summation in memory of a series of saccadic movements carried out within a limited time and a series of tachistoscopic perceptions summed and repeated over much longer periods.

I am not certain what is meant by John Bradshaw's assertion that photographs are veridical. They are certainly verifiable and huge footages of photographic film and print are scrapped every day because of a lack of edge-interpretable definition between subject and ground or around detail within the subject's outline. The photographer who takes no pains, by attention to film chemistry, to lighting, to viewpoint and above all to what is called 'sharpness' through selection of a field of focus, produces images which are not only incapable of being 'posterised' by further photographic or digitised selection but are also unintelligible. The good photographer spends a lot of effort defining outlines and in making certain that the outlines selected by the procedures he has used are capable of stimulating eye movement which will induce the recognition he wants.

Selection of a start point for a scan in photographs can also be demonstrated. Photographs taken at much the same time of the same subject by two photographic students, one of whom wrote preferentially in an Arabic script and the other of Gujerati descent habituated to a Roman script, look startlingly different. The eye is guided in opposing directions from necessarily different start points in each.

J. B. Deręgowski is entirely correct when he says that I have ignored the analysis of texture gradient examined by Gibson (1952) as I have also ignored earlier formulations of the same principle by Leonardo da Vinci (1492-93, in Pedretti 1977) or the source from which he got many of his notions on the matter, Archbishop John Pecham's *Perspectiva Communis* (c. 1290, in Lindberg 1970). In addition, I have omitted any analysis of colour perception and its impact, if any, on the colours spread on cave walls. I have left out both, and in particular texture gradient, because Palaeolithic draughtsmen had no use for them. They drew visual perceptions as flat shapes at right angles to the line of sight. To a greater extent than Greek painters of red and black figure ceramics, the drawings of the early nineteenth century sculptor and illustrator, John Flaxman, or of the painter J. A. D. Ingres, Palaeolithic images are conceived as shapes drawn plane to the surface of the support. In all the paintings and engravings I have seen in the couple of hundred Franco-Iberian Palaeolithic caves I have visited, arrises within an outline are avoided and relief is always achieved by overlap. Variations in texture, and colour where this is present, therefore logically pertains to the object viewed rather than the process of perception and reproduction.

In caves from Cantabria, and the upper valleys of the tributaries of the Gave, the Garonne and the Loire, shapes like the three shapes A, B and C in Figure 1 of Deręgowski's Comment are simply shapes with entirely different visual weights. They are never to be perceived as shapes with different planar orientations to the line of sight. All the four shapes in Deręgowski's Figure 2 can be deemed to represent obliquely positioned cubes in one type of projection or another but only 2d (with the central line omitted) could represent a cube for a Palaeolithic artist; the others would simply represent curiously chequered surfaces of different dimensions.

The La Grèze bison is therefore not bizarre but has much in common with Ingres' much acclaimed portrait of the newspaperman Louis-Francois Bertin (Louvre, R. F. 1011), or Flaxman's frequently reproduced illustration of *Ulysses following the car of Nausicaa*. It is drawn entirely as flat shapes. Though on a slightly curved cave wall, all the shapes are seen to be at right angles to the line of sight once the spectator has advanced a short distance into the quite shallow cavity. Corrections and modifications at the head-end have resulted in at least two heads having being drawn, one on top of the other. One is in side elevation with a single horn and a single eye. The other is in front elevation with two horns and the muzzle displaced from the left-hand extremity of the head shape to somewhere on its centre line. Indeed I am not myself aware of any bizarre animals in Palaeolithic images for which there are not either feasible taphonomic explanations for the apparent distortions, or alternatively explanations of the kind raised by Laming-Emperaire (1959) for the 'bicorne' in Lascaux (though see Lorblanchet and Sieveking 1997).

The refusal to employ oblique planes to create recession which J. B. Deręgowski's Comment pinpoints clearly has a significance. True, in practical terms recession is very difficult to reconcile with a cave wall. Its protuberances and cavities are so very insistent visually that it is impossible to ignore their spatial location. The plain white paper surface in either the oblique surfaces construction of Hu Cheng-Wen's colour woodcut from the *Pictures from the ten bamboo studio* series about 1640, or in a box perspective construction of Albrecht Dürer's black line woodcut from the *Great life of the virgin* series slightly more a than a hundred years earlier, can be regarded as transparent. The undulating support of the cave wall can not. It distributes the drawn images and renders them visible or invisible from one particular position or another. It is a surface whose forms are as visually insistent as the drawings themselves, a surface whose forms and dimensions must have meant as much to designers who selected the cave walls as a support as it did to the people who continued to draw on its walls for at times as much as a further twenty thousand years. Since all this is only possible if oblique planes are avoided it seems probable their absence is intended.

Andrée Rosenfeld is very right to warn that viewer's interest and cultural attachments often interfere with image viewing and particularly with Palaeolithic image viewing. She is also, regrettably, quite right in implying that despite my best endeavours there are bound to be instances of the fault in my paper to which I have been oblivious and she has not addressed herself. There is

also an instance of the fault in her use of the phrase 'intellectually based conveyance of information' in the paragraph in which she makes the point. She uses the phrase to describe communication systems employing what I would prefer rather ponderously to call 'a low level of visual redundancy in their references to real objects'. One has to use some such phrase to distinguish collections of marks with very limited visual reference like Egyptian hieroglyphs or northern Angolan *tusoma* from marks which readily recapitulate a retinal image. Both have also to be distinguished from visual sign systems, such as the words on this page, in which there is no visual reference to real objects at all.

The prejudice about the second (or third) rate nature of representational visual images which is implied in her phrase is deeply rooted in our society though it may not have been so inherent in community relations during the Ice Age. We regard sign systems which are based on verbal communications, and in particular those referencing number directly, as preferable for eliciting understanding in the person to whom the communication is addressed. If it were not so, I might have been able to use drawings for my conclusions about Palaeolithic images rather than words. It is also a prejudice which has motivated the two most influential interpretations of Palaeolithic art of the latter half of this century; the idea initiated by Annette Laming-Emperaire and André Leroi-Gourhan that the more word-like signs on the cave walls should be interpreted as referencing a defining religious system concerned with generation and regeneration of species, and the more widely originated idea to which the names of David Lewis-Williams and Jean Clottes should nevertheless be attached that the same associations of marks thought to be ideoglyphs in the earlier interpretation are entoptic images generated during trance by people to whom the name *shaman* has been given.

With Rosenfeld I do not believe that the rational of Palaeolithic animal imagery is entirely resolved by the form of analysis discussed though it raises some interesting questions. It emphasises that, as Breuil recognised, the intervals on the cave walls between one animal representation and another must have significance. They appear to be proportionate distances, not spasmodic interruptions in a linear progression as Leroi-Gourhan argued. It does not, so far as I can see at the moment, resolve what those distances represent though for some time I have believed that they could represent scaled measurements in the cave's external environment (Eastham 1979, 1991).

The question with which Ann Sieveking concerns herself, the question whether the cryptiforms such as the tectiforms in the Beune valley caves and the hacheforms in Lascaux are very low redundancy images with a visual reference or, as André Leroi-Gourhan (1979b) contended, pictorial references to a symbol system which was ultimately sonic, is also left incompletely resolved by the analysis I have proposed. I have argued that many of these cryptiforms can be shown to be involved with purely visual perceptions but several investigators have demonstrated that marks are present at nodal sonic intervals in caves so it is evident that some sonic symbol system was developed though whether it was of the type researched by Leroi-Gourhan remains hypothetical (Reznikoff and Dauvois 1988; Dauvois and Boutillon 1994; Waller 1993).

The attention she draws to the way in which moving a light source can be used to make outlines change and disappear is particularly valuable and needs constant reiteration when so much comment on cave images depends upon the products of the one photographer. All too often only one team or *equipe* is permitted entry to study a heavily conserved cave and the photographer inevitably follows its particular agenda.

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Résumé. *On examine ici la manière dont l'oeil balaye les objets et les vides dans le champ visuel de l'Occidental européen moderne, ainsi que les processus à l'oeuvre pour sélectionner les instructions qui dirigent ce balayage lorsque se crée une image visuelle. Ces caractèristiques sont utilisées dans une analyse d'images pariétales, analyse qui vise à interpréter leur sens. La comparaison des différences fait apparaître une interprétation du sens des figurations paléolithiques. Les facteurs principaux en sont la posture, l'équilibre corporel, et les autres traits du comportement des animaux représentés.*

Zusammenfassung. *Die Weise, in der das Auge im visuellen Feld des modernen West-Europäers Gegenstände und Leeren absucht und der Weg, in dem Anweisungen betreffs dieser Absuch-Verfahren ausgewählt werden, wenn eine visuelle Darstellung hergestellt wird, werden dazu verwendet, die Bedeutung paläolithischer Bilder zu untersuchen. Aus dem Vergleich der Unterschiede entsteht eine Auslegung der Bedeutung paläolithischer Bilder, die sich auf Haltung, Gleichgewicht und andere Verhaltensmerkmale der dargestellten Tiere konzentriert.*

Resumen. *La manera en que el ojo registra objetos y vacíos en el campo visual del europeo occidental moderno y la manera en que instrucciones concernientes a procedimientos de registro son seleccionadas al crear una imagen visual son usadas para analizar imágenes parietales Paleolíticas para su significado. De la comparación de las diferencias surge una interpretación del significado de las imágenes Paleolíticas que se concentra en la posición, equilibrio y otras características de comportamiento de los animales representados.*

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KEYWORDS: ***Portable art - Epipalaeolithic - Kebaran - Chert object - Israel***

A UNIQUE ENGRAVED OBJECT FROM THE EPIPALAEOLITHIC OF ISRAEL

Daniel Kaufman

Abstract. A recently recovered engraved nodule from the Geometric Kebaran site of Neve David is an important addition to the very small number of such artefacts known from the Upper Palaeolithic and early Epipalaeolithic of the Levant. In comparison to other non-utilitarian objects from the region, the Neve David artefact is unique, both with regard to the raw material and the incised motif but there is a suggestion of cultural continuity into the subsequent Natufian.

The Upper Palaeolithic and early Epipalaeolithic of the southern Levant (c. 40 000-12 500 BP), which incorporate the Ahmarian, Levantine Aurignacian, Kebaran, Geometric Kebaran and other contemporaneous entities, are marked by a notable rarity of non-utilitarian decorated artefacts, namely objects of artistic expression or those which may have held some symbolic meaning for their makers. Each new discovery, then, is of special interest and importance. A recently discovered engraved flint nodule from the Geometric Kebaran site of Neve David to be presented here can now be added to the small inventory of non-utilitarian pieces which have been recovered from this very long period.

The site

Neve David, a Geometric Kebaran site (Kaufman 1987, 1989), is situated at the foot of the western slope of Mount Carmel on the north bank of Nahal Siah at its outlet to the coastal plain, 60 m above sea level and 1000 m from the present shoreline. Excavations yielded a rich lithic assemblage dominated by trapeze-rectangles, abundant and well-preserved faunal remains (Bar-Oz et al. 1997, 1999) and ground-stone implements of both basalt and limestone. Unique to the site were two human burials, the only ones recorded to date from the Geometric Kebaran in the Levant (Kaufman 1987). One of these was in a marked grave which incorporated ground-stone tools (Kaufman and Ronen 1987). Two radiocarbon determinations from charred bone (Kaufman 1988) provided dates of 12 610 ± 130 BP (OxA-892) and 13 400 ± 180 BP (OxA-859). These dates, together with the typological characteristics of the assemblage, indicate that the occupation relates to the latter half of the Geometric Kebaran. On the basis of the site's lowland setting, its areal extent (c. 1000 sq. m) and very high artefact density, it has been proposed that the site served as a winter aggregation camp (Kaufman 1986, 1987, 1989, 1992).

Description of the object

The engraved object (Figure 1) is an elongated flint nodule measuring 90 mm length, 20 mm width and 11 mm thickness, with a plano-convex cross-section. One surface (Figure 1a) is completely covered by cortex. The other (Figure 1b) is nearly entirely covered by cortex but exhibits a small area along one edge from which a series of two to three small flakes were removed. A small area of flint is also exposed obliquely at the widest end of the nodule. This exposure reveals slight damage, raising the possibility that the implement was used as a percussor or retoucher. It is worth noting that numerous similar nodules were found in the excavation. Most were unmodified (Figure 2a) but they often served as raw material, as some of them are in the form of bladelet cores (Figure 2b) or display retouch along an edge (Figure 2c).

The engravings consist of two transverse bands located toward each end of the nodule. Both of the bands encircle the circumference of the nodule and appear on both surfaces. All of the marks are very fine and shallow and none of them penetrate the full depth of the cortex. On surface A the upper band is 15 mm in width and contains a series of parallel and subparallel lines of varying lengths. On the obverse side this band is 13 mm wide and consists of six lines which are truncated by the flake scars extending from the edge and it is possible that these same incisions crossed the entire surface. The lower band on surface A consists of three lines and is 5 mm wide. Just above this band are four shorter oblique marks. On the obverse side, this lower band is 7 mm wide, consisting of five lines.

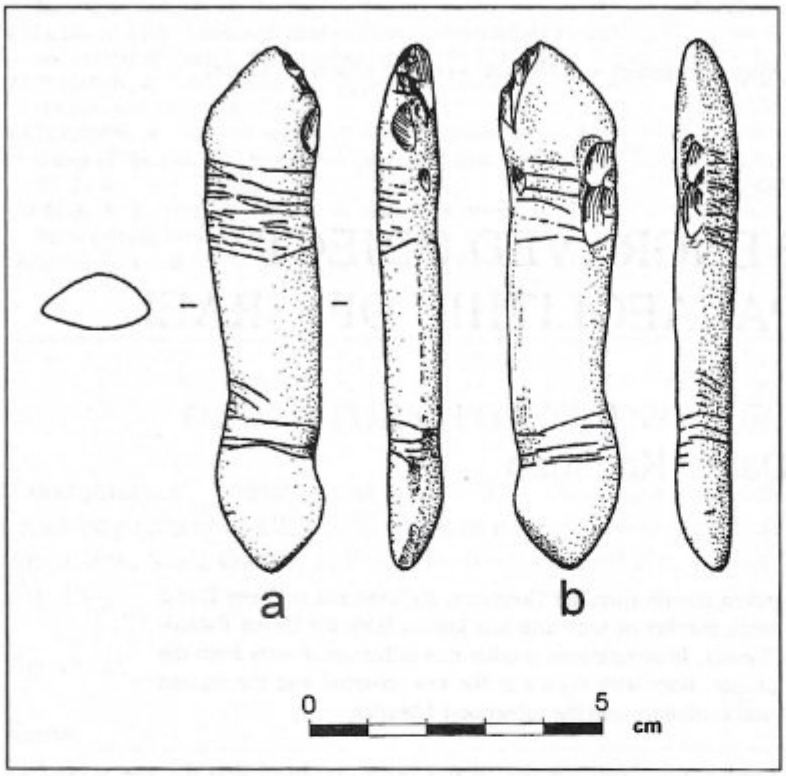

Figure 1. The engraved nodule from Neve David.

Comparisons

As noted, there is only a very small number of decorated, non-utilitarian objects known from the period under discussion, a fact which makes each piece unique. It is therefore difficult to trace continuity through time or to define cultural or regional traditions, due to a lack of recurring patterns and/or motifs within archaeological entities or geographic territories. The following inventory will present brief descriptions of the known artefacts and will serve as a basis for comparisons.

To date, the earliest examples from the Upper Palaeolithic are from Hayonim Cave and Ksar Akil. The Aurignacian of Layer D at Hayonim, dated to 29 000-27 000 BP, has yielded a flat limestone pebble bearing the engraved image of a 'horse' together with additional superimposed lines (Bar-Yosef and Belfer-Cohen 1988; Belfer-Cohen and Bar-Yosef 1981). As noted by Marshack (1997), this is the earliest engraving of an animal from the Levant. This horizon has also yielded five gazelle scapulae, each with a series of notches engraved into the rib of the blade (Davis 1964). At Ksar Akil, in the 'pre-Kebaran' or late Ahmarian horizon (Tixier 1974), a gazelle metatarsal, also dated to 29 000-27 000 BP (Mellars and Tixier 1989), bears five series of short vertical incisions or notches along its length. These sets of marks are interpreted by Marshack (1997) as a system of notation. Somewhat later is the site of Ohalo II, located on the south-western shore of the Sea of Galilee. The occupation is dated to 19 000 BP and affiliated to the closing stages of the Upper Palaeolithic or the very beginning of the Epipalaeolithic. The site has yielded three engraved bones, all point fragments (Rabinovich and Nadel 1994). The most elaborate, found in the context of a human burial, on a fragment of a gazelle radius, bears six sets of short, continuous marks which appear on all surfaces. Of the two remaining pieces, one has parallel incisions which encircle its entire circumference while the other bears a series of aligned striations emanating from one edge but which do not cross the entire surface.

Within the Epipalaeolithic, there is a limestone pebble from the Kebaran site of Urkan e-Rub II in the lower Jordan Valley (Hovers 1990), dated to between 15 000-14 500 BP (Hovers and Marder 1991), which has engravings on both of its surfaces. One surface has sets of ladder-like patterns together with groups of parallel lines. The obverse side exhibits the ladder-like motif together with a large area of cross-hatching. A decorated bone implement, possibly an awl, has been reported from the Kebaran of Jiita II in Lebanon (Copeland and Hours 1977). The fragment has three sets of incisions, two of which are small zigzags, each with several peaks, while the third has a pair of oblique lines. Finally, there is an incised radius shaft from the Phase D Geometric Kebaran of Kharaneh IV in Jordan (Muheisen 1988). The incisions consist of several lines which cross the width of the shaft but do not encircle it.

There are general similarities between the bone objects from Ohalo II and Kharaneh IV with regard to the 'shape and location of marks' (Rabinovich and Nadel 1994-5: 57). Since there are considerable chronological and geographic differences between these two sites it is difficult to see these artistic/symbolic/notational expressions as being related. In addition, the specimen from the Ohalo II grave 'appears to have a common motif with the incised bone from Ksar Akil' (Rabinovich and Nadel 1994-5: 57). Here, too, we are dealing with a gap of some 8000 years, making it difficult to view these finds as representing a common tradition.

The engraved horse from the Aurignacian of Hayonim is unique to the southern Levant. There is an engraved pebble from Öküzini Cave in southern Turkey with a rendering of a bovid (Marshack 1995) which dates to c. 15 000-12 500 BP (Otte et al. 1995) and is of the Epipalaeolithic. Once again, the time and geographic differences preclude the possibility of relationships between these two examples. The ladder motif from Urkan e-Rub is also known from Öküzini (Marshack 1995). While these two cases are much closer in time they cannot be viewed as belonging to a regional tradition because of the distances between them.

The nodule from Neve David, then, differs from all of these examples. Its elongated shape most closely resembles a bone shaft, but its markings are not at all like those on the worked bone implements from Jiita II,

Kharaneh IV, Ksar Akil or Ohalo II. In addition, the material, flint, is different. Where stone was chosen as a medium, such as at Urkan e-Rub and Hayonim, it was limestone in the form of slabs or flat pebbles as opposed to elongated nodules. The motif of two distinct bands of incisions is also distinct as it occurs on no other examples from the Upper Palaeolithic or early Epipalaeolithic of the southern Levant.

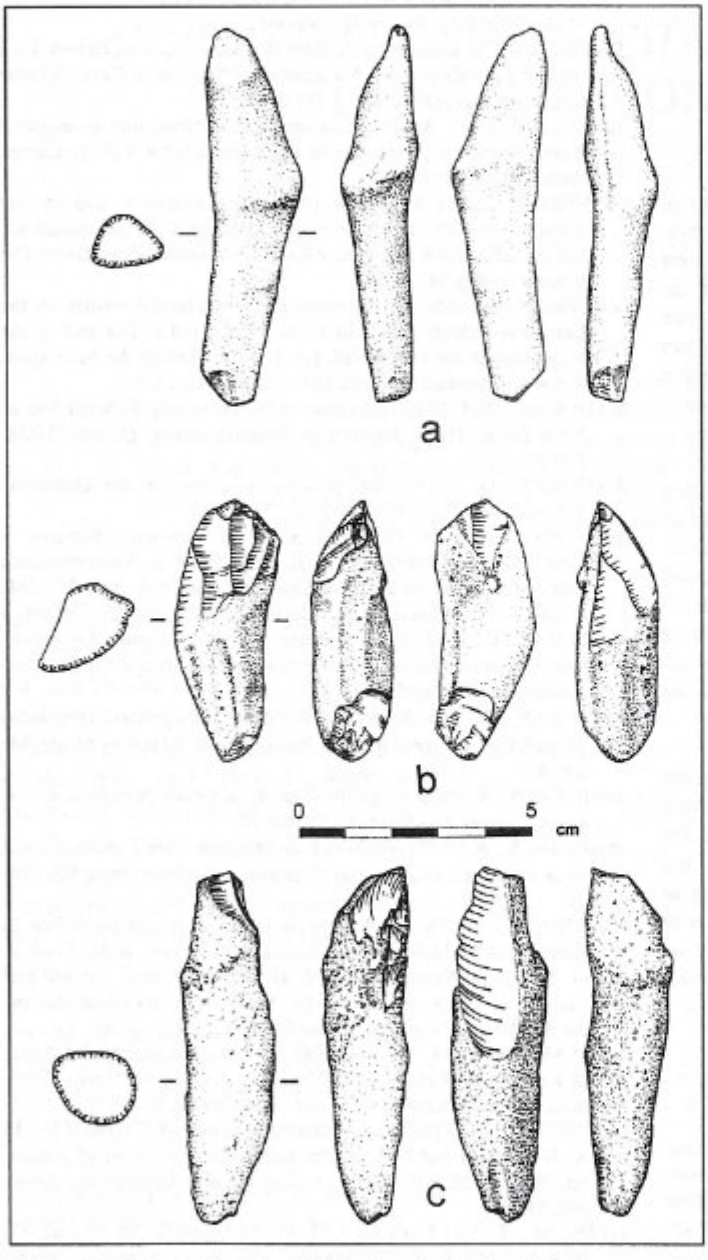

Figure 2. *Examples of additional nodules from Neve David: (a) an unmodified nodule; (b) bladelet core; (c) nodule with lateral retouch.*

It is only when turning to the subsequent Natufian that some parallels can be drawn that suggest continuity. In the early Natufian of el-Wad, for example, there are two elongated flint nodules, each bearing a pair of incisions which divide the pieces into thirds (Weinstein-Evron 1998; Weinstein-Evron and Belfer-Cohen 1993). These nodules have round cross-sections, unlike the plano-convex section of the Neve David nodule, and they are not as elongated. Also, the engravings here consist of single lines only, unlike the bands on the object from Neve David. However, the sectioning of the nodules along their length and the use of similar raw materials may suggest a certain commonality between the two sites. It has been argued elsewhere (Kaufman 1986, 1989, 1992) that Neve David, even though belonging to the Geometric Kebaran, shares several features with the Natufian. This is seen in the size of the occupation, settlement pattern, burial customs and ground-stone implements, all of which indicate continuity between the Geometric Kebaran and Natufian. The similarities between the engraved nodules from the two sites is another manifestation of traditional continuity through time.

Discussion

It is difficult to give a specific meaning to the Neve David object. Its engravings do not resemble the notation-like markings on the Ksar Akil bone or those documented from the Upper Palaeolithic and Mesolithic of Europe (Marshack 1972). There is a possibility that the markings were intended to signify group identity and the fact that the piece was recovered from what has been interpreted as an aggregation site is relevant to such an interpretation. However, if this interpretation is correct, then additional similar objects would be expected to be found which simply is not the case, at least so far. It seems that the most parsimonious explanation is that the engravings are decorative in nature, a notion which is supported by the fact that the implement probably functioned as a percussor or retoucher.

Even with the addition of the implement from Neve David, the inventory of decorated objects is still extremely small. There is the old adage that the absence of evidence does not necessarily imply evidence of absence and there is the strong possibility that artistic endeavours were rendered on perishable media such as skins or wood. In addition, even though many Upper Palaeolithic and Epipalaeolithic sites are known in the southern Levant, very few of them have been the subject of extensive excavations with most being subjected to relatively small sondages only. These considerations, though, are unlikely to fully explain the paucity of artistic expression. It is more likely 'that we need to seek answers in the social realm' (Bar-Yosef 1997: 181). Such approaches have been advanced by Belfer-Cohen (1988, 1991) and Hovers (1990) who relate the scarcity to the existence of small social groups and a lack of scalar stress. Whatever the explanation, in accordance with Copeland and Hours (1977), it can no longer be argued that the Natufians were the originators of southern Levantine art, as its precursors are to be found in the immediately preceding archaeological cultures.

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Résumé. *Un nodule gravé, récemment découvert dans le site de Neve David, site datant du Kébarien Géométrique, constitue un ajout important dans la très courte liste d'artefacts analogues provenant du Paléolithique supérieur et de l'Epipaléolithique ancien du Levant. Si on le compare aux autres objets non utilitaires trouvés dans cette région, l'artefact de Neve David est original, autant par la matière première utilisée que par le motif gravé. Mais une continuité culturelle jusque dans le Natoufien qui suit peut être suggérée.*

Zusammenfassung. *Ein vor kurzem gefundener gravierter Stein von der Geometrischen Kebara Fundstelle Neve David ist ein wichtiger Zusatz zur sehr kleinen Zahl solcher Artefakte, die vom Oberen Paläolithikum und frühem Epipaläolithikum der Levante bekannt sind. Im Vergleich zu anderen nicht-utilitaristischen Gegenständen des Gebietes ist der Neve David Artefakt einmalig, sowohl in Hinsicht auf das Rohmaterial als auf das eingeschnittene Motiv, aber es gibt eine Andeutung kultureller Kontinuität in das nachfolgende Natufien.*

Resumen. *Un nódulo grabado recuperado recientemente del sitio 'Geometric Kebaran' de Neve David es una importante adición al muy pequeño número de tales artefactos conocidos del Paleolítico Superior y del Epipaleolítico temprano del Levante. En comparación con otros objetos no utilitarios de la región, el artefacto de Neve David es único, tanto respecto a la materia prima como al motivo inciso, pero existe una sugerencia en cuanto a una continuidad cultural en el subsiguiente Natufian.*

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KEYWORDS: ***Iconography - Meaning - Petroglyph - Ethology - Galicia - Spain***

PRE-HISTORIC OPEN-AIR ROCK ART IN GALICIA, NORTH-WEST SPAIN: CHARACTERISTICS AND PRINCIPAL ICONOGRAPHY

Roberto Vázquez Rozas

Abstract. This study summarises the author's research into petroglyphs in Galicia, north-western Spain, thought to be from the Chalcolithic and Bronze Ages. It begins with a short historical review of the investigative tradition in this area. The criteria used for dating the petroglyphs are then dealt with, and their technical characteristics and geographical distribution. The expose continues with the intrinsic analysis of the decorated rocks, the relationship between shape and support, and the representation of space and movement. It concludes with a more detailed discussion of the principal themes and iconography discovered to date.

Introduction

Here we propose to sum up some of the conclusions of our research into open rock art in Galicia, north-western Spain (Fig. 1), thought to be of the Chalcolithic and Bronze Ages and known by the name of Galician petroglyphs. At present around 1200 petroglyph panels have been registered. These are almost always assembled into groups of between four and thirty decorated rock panels.

Galician petroglyphs are always carved on granite rocks and are composed of one of two types of groove — V or U-shaped (Fig. 2). The former include Christian symbols, writing characters and even notation marks. The latter are of pre-Historic traditions that appear in the Chalcolithic Age, experience great development during the early Bronze Age and disappear at the beginning of the Iron Age (Fig. 3).

Petroglyphs attributed to the Chalcolithic and Bronze Ages are grouped into:

(a) 'Geometrical': cupules, circles, concentric circles, spirals and labyrinths.

(b) 'Figurative': interpreted as cervid, equine, riding scenes, diverse types of anthropomorphs, weapons.

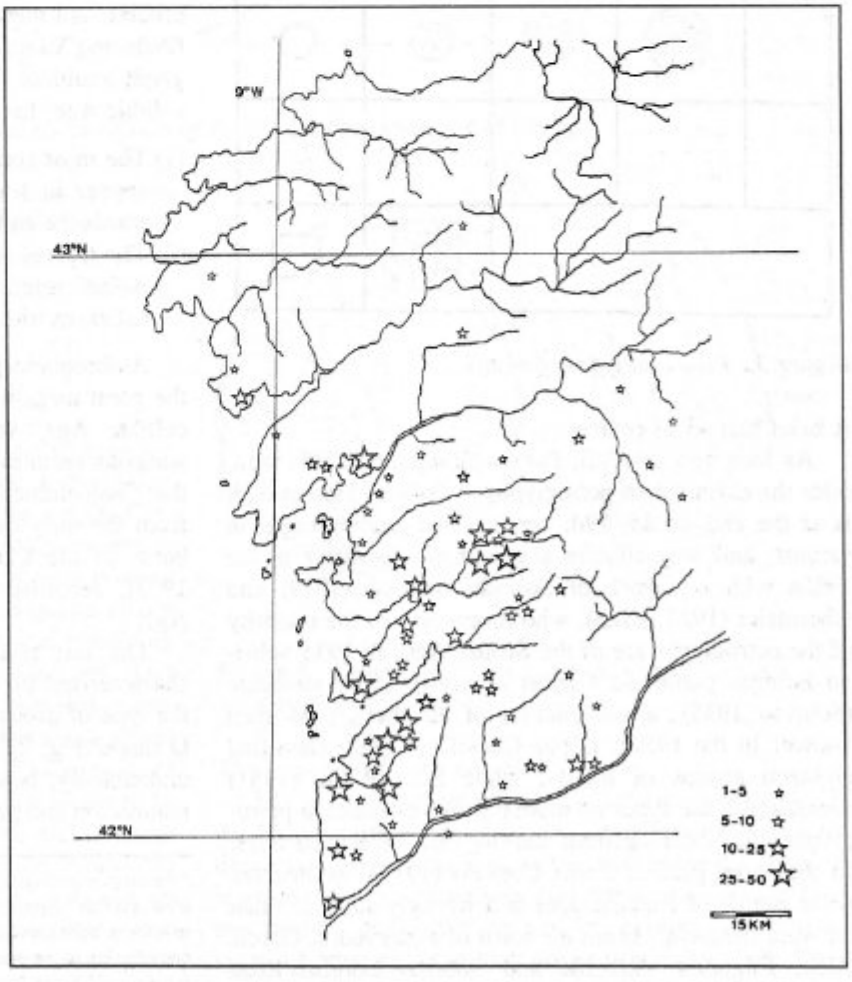

Figure 1. *Distribution map of Galician petroglyph panels.*

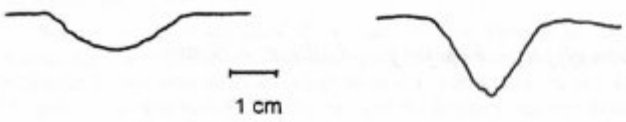

Figure 2. Cross-sections of the V and U grooves.

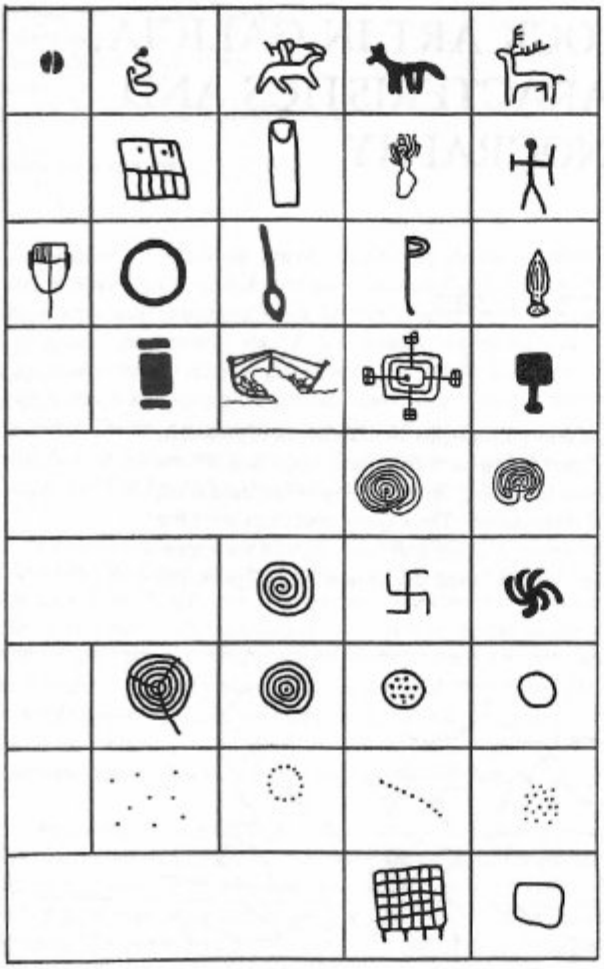

Figure 3. Principal types of motifs.

A brief historical review

As long ago as 1745, Father Sarmiento (1745) mentions the existence of petroglyphs in Galicia. However, it is at the end of the 19th century that studies begin in earnest, and they acquire a systematic character in the 1920s with the work of Sobrino Buhigas (1919) and Obermaier (1923, 1925), who proposed that the majority of the petroglyphs are of the Bronze Age. In 1935 Sobrino Buhigas published *Corpus petroglyphorum galleciae* (Sobrino 1935), a compilation of all the glyphs then known. In the 1950s, López Cuevillas (1952) classified eighteen groups of motifs, while Mac White (1951) connected some types of motifs found in Galician petroglyphs with the megalithic carvings of the British Isles. In the same period, Ferro Couselo (1952) documented some motifs of Historic ages and wrongly supposed that all were medieval. From the town of Pontevedra, García Alén, Filgueira Valverde and Sobrino Lorenzo-Ruza continued this investigative work. Between 1964 and 1974, Anati (1964, 1966) published some typological and chronological classifications which categorise the petroglyphs from the Epipalaeolithic Age to the end of the Iron Age with methods of indirect dating based on a perceived evolution of shape. From 1979, research was orientated by the syntheses and monographs of Vázquez Varela and Peña Santos (Peña and Vázquez 1979; Vázquez 1990, 1995, Peña et al. 1993; Peña and Rey 1993), either in joint or individual studies. The 1980s brought the discovery of new rock art sites by Costas Goberna (1984) and the application of spatial archaeological methods by Bradley, Criado and Fábregas (Bradley et al. 1994; Bradley 1997).

Since 1989 the author has carried out research into different aspects of Galician petroglyphs. This includes distribution analysis, archaeological excavations, a study of relationships between the carved motifs and the shapes of the support, transformations from the natural referent to the carved design, local styles, formal resources used to represent depicted depth and movement, and research into iconography.

Criteria used to estimate the ages of pre-Historic motifs

The methods for estimating the ages of the majority of Galician petroglyphs as being of the Chalcolithic and Bronze Ages are based on technical and archaeological criteria. All these techniques only permit indirect dating (Peña and Vázquez 1979). The beginning of these petroglyph traditions is estimated to be at the end of the Chalcolithic Age, for which there are two reasons:

(1) The most common geometrical motifs of the rock art appear in some Galician megalithic monuments towards the end of the Chalcolithic Age (c. 4000 BP).
(2) The figures of weapons and 'anthropomorphous cylinders' resemble those of artefacts from archaeological excavations (Peña and Vázquez 1979).

Anthropomorphous cylinders[1] are characteristic of the great megalithic monuments of the end of the Chalcolithic Age, while the motifs considered to depict weapons seem to correspond to daggers from the end of the Chalcolithic and the early Bronze Ages, to swords from the early or possibly middle Bronze Age, and halberds of the Carrapatas type (Meijide 1989; Schubart 1973), recorded archaeologically in the early Bronze Age.

The last phase of the pre-Historic petroglyphs is characterised by other archaeological data. Technically, the type of groove with a very worn section of an open U shape (Fig. 2) is not present in the petroglyphs which, undoubtedly, belong to an Historic period between Romanisation and present.

[1] Anthropomorphous cylinders are often cited as cylinder idols but this term is rather inappropriate as it has an interpretative nuance which has in no way been proved. Ucko has made a very important critical contribution to the interpretation of pre-Historic anthropomorphous figurines (Ucko 1970 and 1977). We ourselves have published a study on these problems (Vázquez Rozas 1992/93).

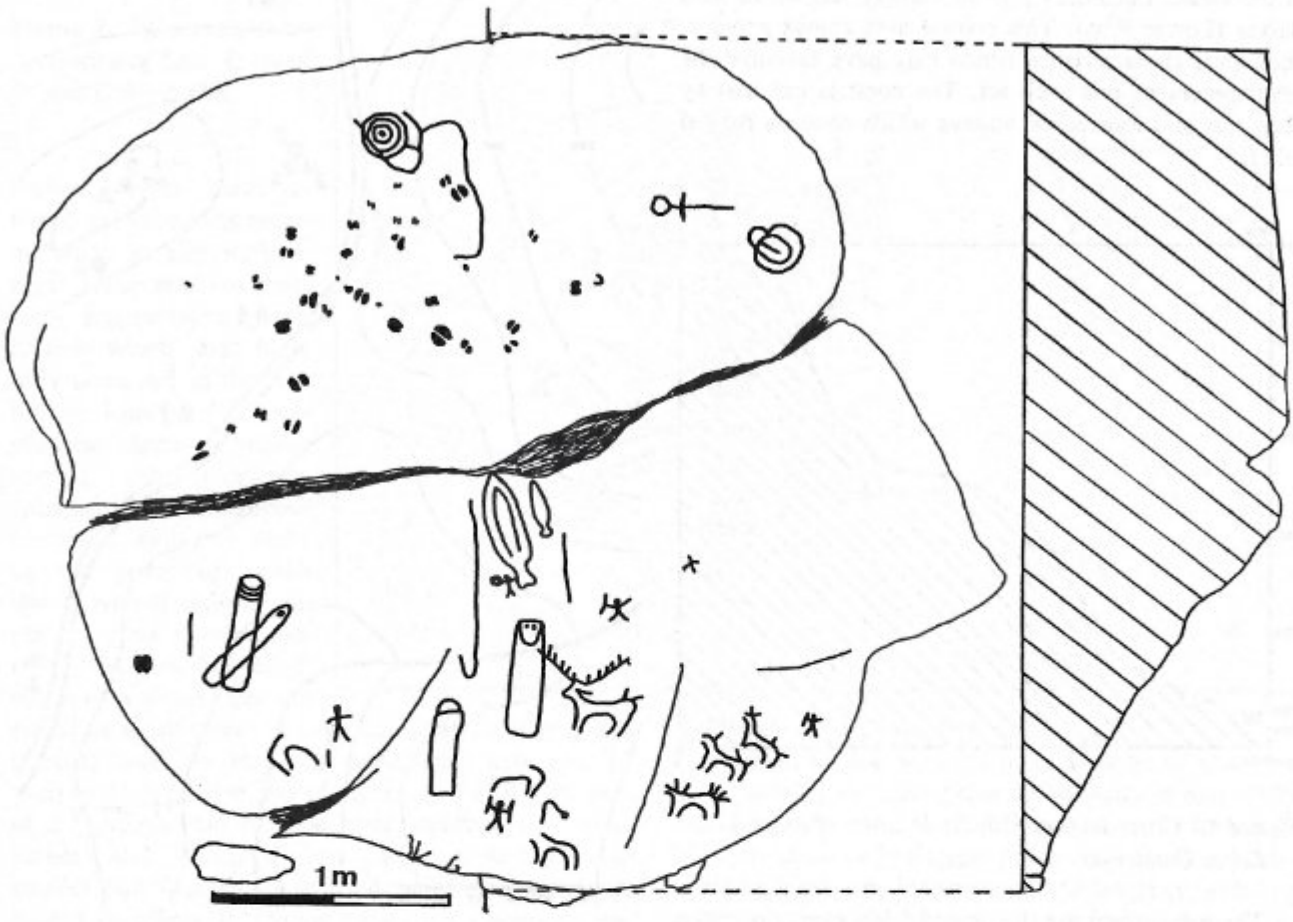

Figure 4. Plan and cross-section of Pedra das Ferraduras, Cotobade.

A decreased significance of these carvings seems to be indicated at the beginning of the Iron Age (about 2700 BP), when fragments of petroglyph-bearing rocks appear forming part of the walls of dwellings and some petroglyphs are concealed by the walls of fortified settlements.

The percussion technique

The U-shaped groove which remains today may not resemble the original appearance of the petroglyphs. Peña Santos' archaeological excavations at the Os Carballos petroglyphs discovered signs of percussion used to make the grooves. The author's archaeological probing at Pedra das Ferraduras (Fig. 4) revealed quartz stones with the ends worn by percussion, a technical possibility we confirmed through experimental archaeology. Our most recent excavations at Pedra das Procesións provided a stone tool taken from the valley to the sierra where the petroglyph is located (Figs 5 and 6). The grooves of the petroglyph were probably painted, which seems to be suggested by the small fragments of ochre and charcoal and the rough mortar, found in the Pedra das Procesións excavation near the stone tool. Red paint survives on limestone rocks in Spanish and Portuguese petroglyphs which provide a better base for the adherence of paint than granite.

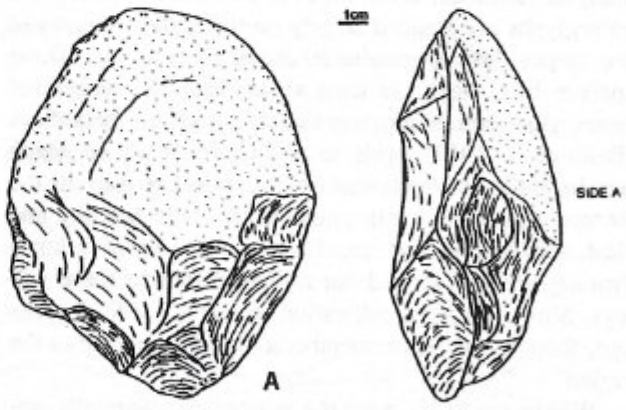

Figure 5. Stone tool excavated in front of Pedra das Procesións, Gondomar.

The location of rock art sites

The petroglyphs are not distributed evenly throughout the Galician geography (Fig. 1). Their location seems to depend on various factors. In the first place the support is always granite comprising two different micas, of fine and medium grain. We do not find petroglyphs on outcrops of other rocks (which are schists and slates). Secondly, the great majority of petroglyphs are concentrated

in the western coastal fringe of Galicia, known as Rías Baixas (Lower Rías). This coastal area enjoys geomorphological characteristics which may have favoured the development of this rock art. The coast is cut into by deep *rías* and transversal valleys which create a rugged relief.

Figure 6. Cross-section with the location of Auga da Laxe, Gondomar.

The petroglyphs are distributed fairly evenly over the granite outcrops of the Galician Rías Baixas, a characteristic which becomes all the more apparent as we discover new rock art sites. If we reduce the scale of our analysis to a local level we note that in each valley the petroglyphs are situated largely on the highest shelves of the slopes, where granite is abundant (Fig. 6). These shelves have been, at least since Neolithic megalithic times, good communication channels between the valleys (Bello et al. 1987), with an abundance of places which overlook the lowlands and whose possible uses in the Bronze Age were hunting, extensive cattle farming and slash and burn cultivation. Hunting and extensive horse farming are still carried out in the uplands of these valleys. Slash and burn cultivation was abandoned decades ago, though it is still remembered by older people in the region.

Within the study area the petroglyphs normally appear grouped into small clusters. Many of these rock art sites possess internal coherence because of the diverse carved motifs and the distribution of the rocks over the relief. It is not unusual to find a linear distribution along a hill or a small valley in which representations of 'deer', 'humans riding horses' and concentric circles alternate rhythmically. One paradigmatic case is that of the rock art site at Os Campos in Baiona (Fig. 7), where simple and concentric circles are situated on flat rocks at ground level at the bottom of the little valley, while on a vertical rock which overlooks the passage, forty 'horses' and a three-armed curved swastika were carved.

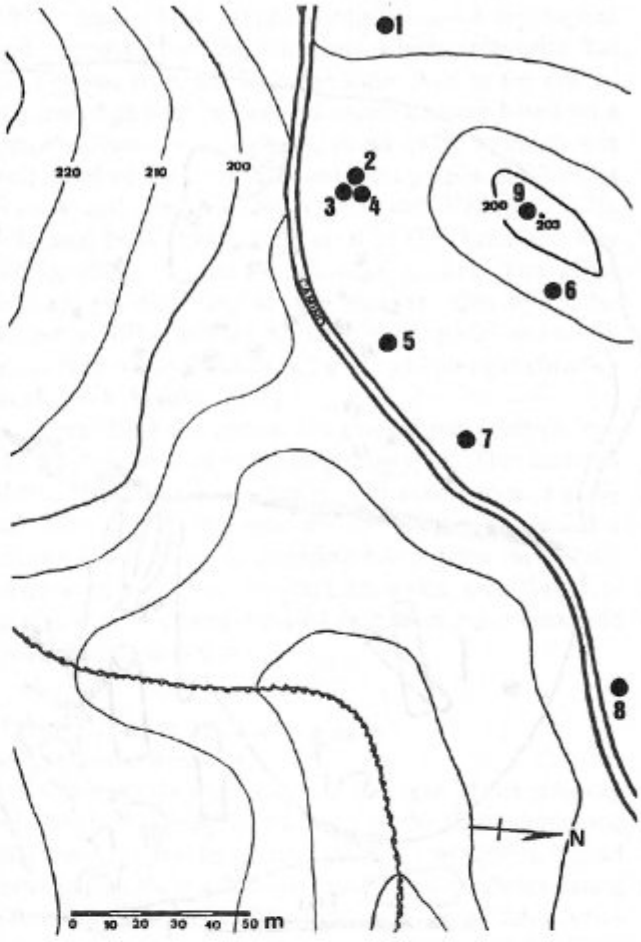

Figure 7. Distribution plan of the motifs at Os Campos, Baiona.
nº 1 to 8: cupules, circles and concentric circles.
nº 6: 40 equines.
nº 9: chart shape.

The relationships between shape and support

The granite tors in Galicia are very eroded and have a great variety of shapes, the most frequent of which is rounded. Nevertheless, we do not find carvings on this shape but on rocks with smooth, flat surfaces, horizontal or inclined and very rarely vertical. The horizontal surfaces do not have a predominant viewpoint and, as argued below, the motifs developed on them do not require this. However, the sloping faces of the rocks function as display panels on which motifs are set out. On many occasions these seem to form narrative scenes (Figs 4, 8 and 9).

In order to understand the relationship between carved shapes and the rock support we must explain the distinction between motifs of unknown and supposedly known referent. This first classification of carved motifs into two groups is based on Panofsky's iconological method: the first phase of analysis or pre-iconography should be to recognise what the shapes represent. Panofsky's method has been applied to diverse aspects of our investigation (Panofsky 1962). Circles and concentric circles, spirals, cupules and other geometrical motifs had a significance which is unknown to us. We do not ever

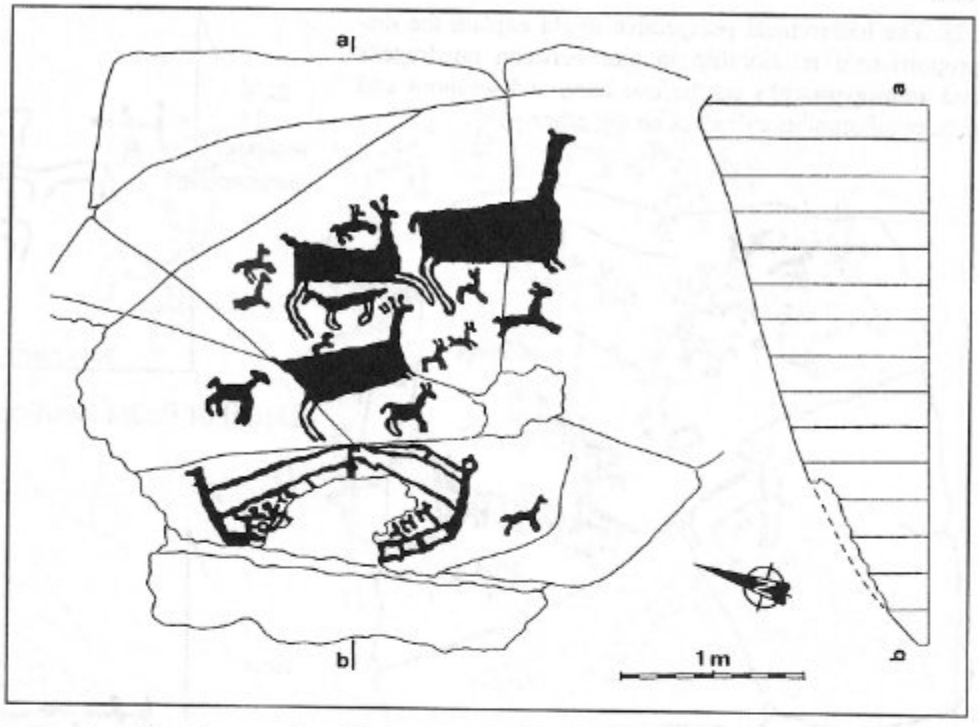

Figure 8. Plan and cross-section of Laxe da Auga dos Cebros, Oia.

know whether they referred to something tangible or to an abstract concept. There are, however, some interpretative possibilities which are more fully discussed in the section on iconography. Quadrupeds, apparent riding scenes, anthropomorphs, 'weaponry' and anthropomorphous cylinders make up the group of motifs whose natural referent we can recognise with reasonable conviction, but recognition of a shape does not reveal its significance. This group of motifs of proposed referent may, in turn, be subdivided into two by analysing the relative size of representation and the uses of the groove. On the one hand, quadrupeds, 'riding scenes' and 'human figures' are represented much smaller than their natural referent, while the groove only depicts its silhouette. On the other hand, 'weapons' and anthropomorphous cylinders are portrayed larger than the objects they presumably represent and their grooves show both the outline and internal details of the model. It is possible that these differences in representation show a diverse appraisal of what is represented, or the artefact character of the weapons and anthropomorphous cylinders.

As we can see in the example in Figure 4, geometric motifs occupy the horizontal area of the rock, accompanied in this case by representations of ungulate footprints while on the sloping face a supposed deer hunt and three anthropomorphous cylinders are represented. The inclination of the support participates actively in the representation of the 'hunt', since it gives depth to designs which are in themselves two-dimensional. This involvement of the support seems also evident at Laxe da Auga dos Cebros (Fig. 8, 'Deer's Water Rock'), since at the foot of the rock flows a stream along which a 'boat' appears to sail.

The apparent representation of space

In order to deal with the representation of space we must begin by explaining that the majority of apparently recognisable motifs is carved by means of the front-profile convention or bi-angular perspective. They are related to each other by juxtaposition and tangency, avoiding overlapping and superposition which might render recognition difficult. The few exceptions to this rule merit an explanation as argued in the iconography section of this paper. Thus, each figure possesses a three-dimensional volume which is due not to mimesis but to convention, because its referent possesses it. If there was a means of representing depth in Galician petroglyphs, this must have been in accordance with the spatial conception of the motifs, based on juxtapositions and tangencies, and supported by the inclination of the support.

The projection or flattened perspective appears on different occasions. The figures placed higher up on the rock must be seen from further back. In fact, this occurs because of the inclination of the support (Figs 11 and

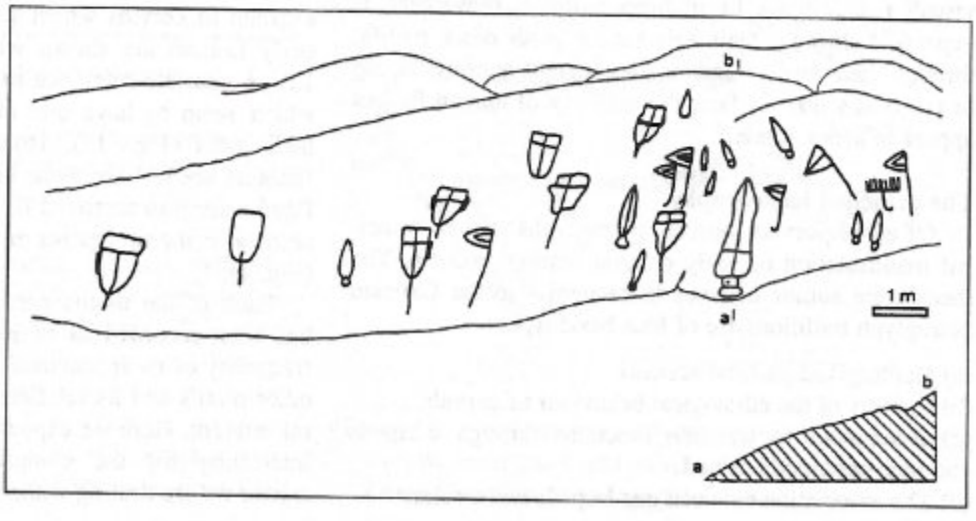

Figure 9. Plan and cross-section of Pedra das Procesións, Gondomar.

12). The hierarchical perspective might explain the disproportionate relationship in size between quadrupeds and anthropomorphs on the one hand and weapons and anthropomorphous cylinders on the other.

Figure 10. Laxe do Cuco, Cotobade.

The apparent representation of movement

We find apparent movement, essentially of three types, represented by simple techniques:

(a) Depicting parts of the figure with turns and bends.
(b) By evoking a before and an after; a time sequence.
(c) By the perception of geometrical rhythms.

Frequently, quadrupeds were represented in a trotting or running posture, by means of bending of their limbs and raising of their hindquarters. We also find a high number of cervids trotting with the back of the neck and head raised. When the desired action affects two animal figures, as in presumed coitus and the presumed sniffing of genitals (Fig. 10), the carvers did not turn merely one part of the animal. The entire figure adopts a position to prevent the superposition of lines which would hinder visual recognition. In anthropomorphs, movement is expressed through their relationship with other motifs, through their involvement in an apparent hunting, riding or pastoral scene. In fact, the majority of human figures appear in action mode.

The principal iconography

Of all preserved sources, petroglyphs are the principal manifestation of early communication systems. The themes the author believes to recognise in the Galician petroglyph traditions are of four basic types:

(a) Hunting and pastoral scenes.
(b) Aspects of the ethological behaviour of cervids.
(c) References to war-like functions through weapons and men apparently armed.
(d) The association between quadrupeds and circles.

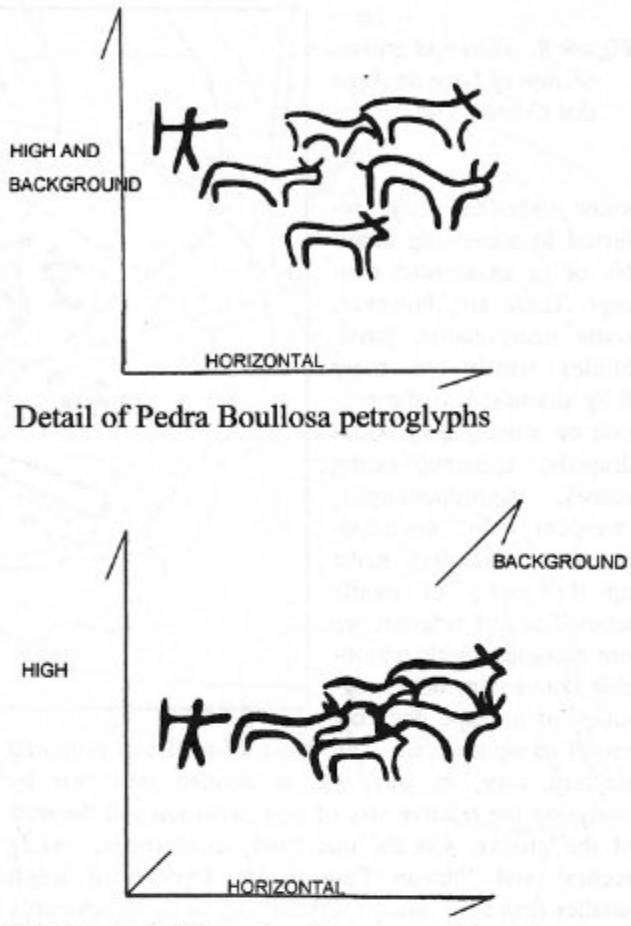

Figure 11. 'Pastoral scene' at Pedra Boullosa, Campo Lameiro.

Pedra das Ferraduras (Fig. 4) and other rocks bear petroglyphs in which the author believes hunting and pastoralism have been represented in diverse ways. These may be classified into several types. In the simplest, a human figure is juxtaposed with one or several quadrupeds. It is not possible to make out whether it is meant to be hunting or shepherding them, or even that the anthropomorph is juxtaposed intentionally (Fig. 11); even more complex is the group of petroglyphs in which a group of cervids which seem to be moving in an orderly fashion are shown with an anthropomorph (Fig. 12). A possible reference to hunting is found in cervids which seem to have one or more weapons stuck into their sides (Fig. 13). However, the most interesting 'hunting scenes' are those in which one or more human figures seem to surround or give chase to cervids which seem to come up against an anthropomorphous cylinder (Fig. 4).

Each of the motifs present in the previous 'scenes' has been recorded as to its position on the rock, the frequency of its appearance, its inferred association with other motifs and its relationship with its presumed natural referent. Here we expound the aspects which we find interesting for the comprehension of the presumed scenes we are dealing with.

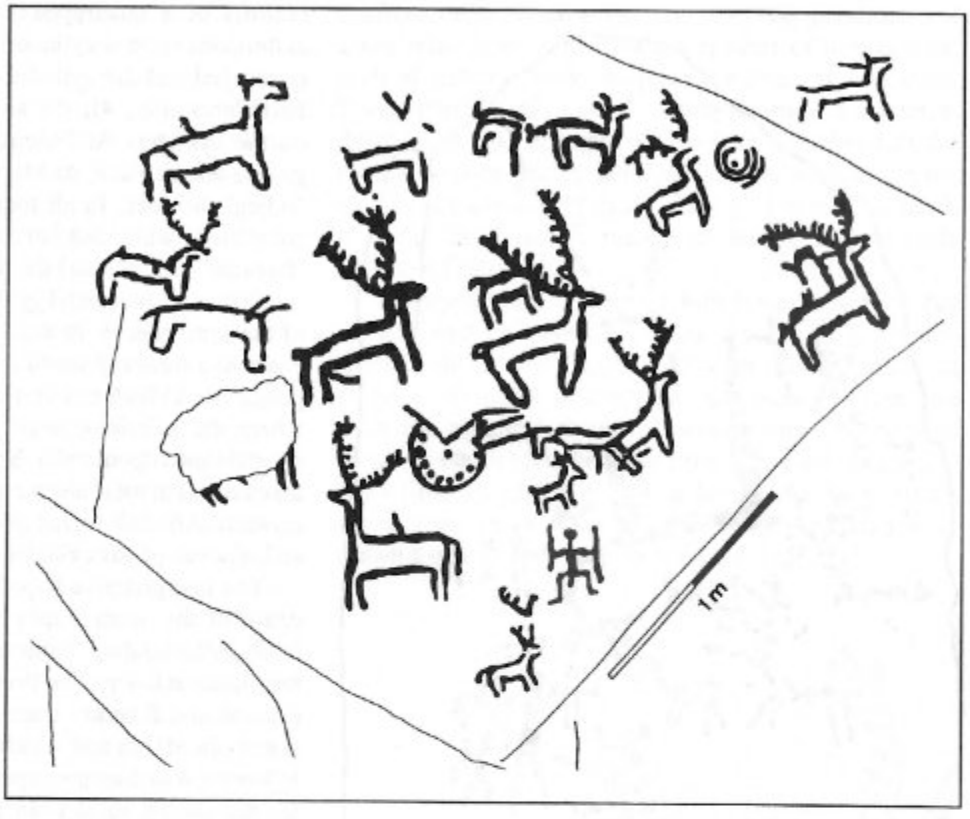

Figure 12. Groups of cervids at Naval de Martiño, Pontecaldelas.

The diverse scale of representation of the different motifs and the different ways of depicting man perhaps keeps part of the petroglyphs' original significance. These are aspects which we can study in the light of the psychology of perception (Arnheim 1974, 1982). The scale of representation is defined by the size relationship between the object represented and its representation. It is not an absolute value, but rather a comparative instrument which seems to reveal the social consideration which each object had among the artists, because it is possible that the most important objects were depicted larger (Arnheim 1974, 1982). The scale distinguishes anthropomorphous cylinders/plaques and daggers and swords, a distinction which appears to be a kind of hierarchical perspective that highlights what is most valued by the carvers. The interpretation is reinforced by the internal markings which only appear in these types of motifs. Objects made by people, therefore, may possess a special value in these traditions (Table 1).

Motif	Proportion of life size	Frequency
Anthropomorphs	Between 1/6 and 1/10	2.6%
Quadrupeds	Between 1/5 and 1/10	12.2%
'Riding scenes'	Between 1/5 and 1/7	1.4%
Anthropomorphous cylinders	Between 1/1 and 2/1	0.4%
'Swords' and 'daggers'	Between 1/1 and 7/1	2.2%

Table 1. Relative scale of motifs and referents.

Artefacts appear to receive a 'privileged' representation. This could be interpreted as an expression of the subconscious perception in Chalcolithic and Bronze Age societies of the value of human activities as transformers, as wheels of cultural change: humans, who, by means of their weapons, tools and myths dominate nature, transforming it for their own benefit. This interpretation is reinforced by the fact that representations of humans in petroglyphs only appear when they are performing a dynamic action. Such a schematic depiction does not identify them as individuals if it is not supported by an oral tradition. The image seems to limit itself to referring to an action. The majority of anthropomorphous petroglyphs appears to hunt, shepherd, ride and sail. The image of a person on a plaque or cylinder is not of a human, but is the image of an image. This artistic convention shows a familiarity with the communicative capacity of images which is far greater than might at first be thought. The simplicity of the stylistic resources employed does not imply simplicity in iconographical and cultural references.

Figure 13. Motif interpreted by the author as a deer with weapons stuck into its side. Laxe dos Carballos, Campo Lameiro (drawing after A. Peña Santos).

Figure 14. Paintings from the dolmen at Orca dos Xuncais, Satao, Viseu, Portugal.

The archaeological contexts of these anthropomorphous plaques and cylinders are essentially funerary (Bueno 1990). This has led some prehistorians to speak of a funerary divinity implanted in megalithism. However, this is not the only likely option to explain the funerary context of these figures (Bueno 1990; Vázquez Varela 1995). In Galicia, they have appeared set into the ground at the far end of the access corridors to dolmens (Bello 1988; Rodríguez 1990). In Portugal, funerary plaques form part of the grave goods in dolmens, natural and artificial grottos and tombs with a false cupula (Farinha 1972; Victor 1990). Petroglyphs which depict similar objects with 'swords' and 'daggers' appear in the north of the Iberian Peninsula on another five occasions (Amalio and Cesar 1992). Here it is not a contextual but rather an iconographical relationship with the funerary that is manifested with the weapons most frequently depicted in Galician petroglyphs.

Pedra das Ferraduras (Fig. 4) and some other sites provide us with evidence of the existence of an oral tradition which is captured in the petroglyphs. These examples coincide in different aspects of their composition, but in a way that could not be the result of the copying of shapes but rather the individual interpretation of a common content. All this is endorsed by the existence in the Portuguese Beira Alta of another version of the same iconography in a megalithic painting: Orca dos Juncais, Satão, Portugal (Fig. 14). The central scene consists of a quadruped which is moving towards an anthropomorphous cylinder. At Coto do Rapadoiro, the quadruped and the cylinder are juxtaposed. At Laxe das Ferraduras (Fig. 4), the animal's horn is superimposed on the cylinder. At Outeiro do Cogoludo they share a groove and at Naval de Martiño (Fig. 12), the cylinder is 'riding' the deer. In all four cases the apparent scene is completed with one or more anthropomorphs who 'threaten' and 'pursue' the 'deer'.

Orca dos Juncais (Fig. 14) presents another version of the same theme. In this case there are not only references to a funerary world through the representation of a plaque or cylinder, but through the dolmenic context where the paintings were found. The 'scene' presents several anthropomorphs brandishing bows and arrows together with what appear to be six dogs attacking four cervids. All this seems presided over by a plaque or anthropomorphous cylinder.

The interpretative hypotheses for tackling the significance of this iconography are, in our opinion, the following: the hunting theme is a reflection of a prestigious masculine activity. The deer is valued as an animal with cyclical and funerary connotations because of the antler it loses in March and which grows back again during the following four months in order to be ready in the autumn for the rutting season. In proto-Historic European mythology the cyclical and rejuvenating character of the deer's antler is related to life after death, to a journey to and from the world of the dead (Briard 1987; Vázquez Varela 1995). It is also a sought-after hunting trophy.

The anthropomorphous cylinder can be interpreted in two ways which are not mutually exclusive: as a generic being from beyond the grave, whether a mythical ancestor, god of death or the like, or as the representation of individuals who are dead or who venerate the dead.

The location of rock art sites on the highest shelves of the hillsides may shed light on the content of hunting iconography. One of the uses of these shelves is hunting, which together with extensive cattle farming and slash and burn cultivation forms the possibilities of economic use in these areas during the Chalcolithic and Bronze Ages. Of these three uses, preference seems to be given to hunting, transforming it into a theme for rock art. Cattle farming occupies a very secondary place and agriculture is never reflected in the petroglyphs. This does not directly illustrate the use given to the hills in the period the petroglyphs were created, but rather the scale of values according to which the carvers considered a subject worthy of being captured on stone.

The meanings we can offer in order to explain the juxtaposition between deer and anthropomorphous cylinder might even be contradictory:

(1) The deer's life is saved under the protection or guidance of the cylinder.
(2) The deer dies and enters into the world of the dead at the hands of the cylinder.
(3) Deer hunting has special character, perhaps with a certain taboo, due to its close relationship with the anthropomorphous cylinder.

The ethology of cervids in petroglyphs

Given the abundance of representations of cervids, it is interesting to examine what ethological guidelines merited the attention of the rock art producers. The choice must have been made in terms of certain concrete values which might shed light on the content of Galician petroglyphs.

In Iberian fauna, *Cervus elaphus hispanicus*, or the common deer, belongs to the cervid family along with the fallow and roe deer. The largest of the three Iberian cervids but the smallest of the European *Cervus elaphus* do not exceed 140 kilograms and there are regional variations in their corpulence and the size of their antlers.

Apart from in the rutting season, at the start of autumn, deer live in separate herds. On the one hand there are the males and on the other the females with their young from the previous two years (Delibes 1990).

The female group forms a clear hierarchy. At the head an older female that still has descendants leads the group on the march. The second in the hierarchy brings up the rear on journeys. Within the group there are family units comprised of a female, her daughters and grand-daughters, as well as male offspring under two years of age. When the group grazes the two senior female deer remain vigilant, head high, watching and smelling the wind. For parturition the deer move away from the group and even push away their young from the previous year. Later, it is common to see the mother accompanied by a fawn or a yearling. The latter will leave the females' herd on producing its first antlers (Delibes 1990).

The male group has a less clear hierarchy and it is not uncommon to see its members roaming about on their own. Between March and April first the older ones, then the youngest, lose their antlers so the hierarchy is reversed. Throughout the spring and the first months of summer the antlers grow. Their size is in accordance with age and diet. This growth appears to bear no direct relationship to the size of the animal. 'In Galicia the deer are large with small compact horns with few points' (Mateo 17th century; Felipe IV's head crossbowman), perhaps because 50 per cent of the content of the horns is tri-calcitic phosphate, a compound which is generated with difficulty in the acid soil typical of Galicia (Delibes 1990).

During the growth of its antler the deer hides in the thickets eating abundantly. In July it rubs them vigorously against trees and scrub to remove the velvety skin which covers it. As the antler grows the animal's fur changes from grey to a reddish brown (Aizpuro 1990; Delibes 1990).

In September the males abandon their quiet lives in small groups, become belligerent and the mating or rutting season begins. Its most striking aspect is the hoarse bellowing of the aroused males. At the same time their necks swell and they take to rolling in the mud and their own urine. The strongest males will gather together a harem and will defend it from rivals with threats and confrontations. During the day they lie prostrate and graze reluctantly, following the rhythm of the females, each of which is only receptive for three or four days. The bellowing and sexual activity is most frequent at dawn, dusk and at night. When deer are abundant the rutting grounds are the same every year, normally in flat woodland clearings. With the coming of winter the herds of males and females reunite to initiate a new cycle (Aizpuro 1990).

Representations of cervids with large antlers, in full rut and with enormous phalluses which clearly demonstrate their arousal, appear all over the geographical range of Galician petroglyphs. On occasion they are even the principal theme of some panels. More than coitus or the fighting between males, it is the spectacularity of the sounds of the rut, a hoarse bellowing somewhere between a whinny and a roar, that must have drawn the attention of the rock artists (Fig. 15).

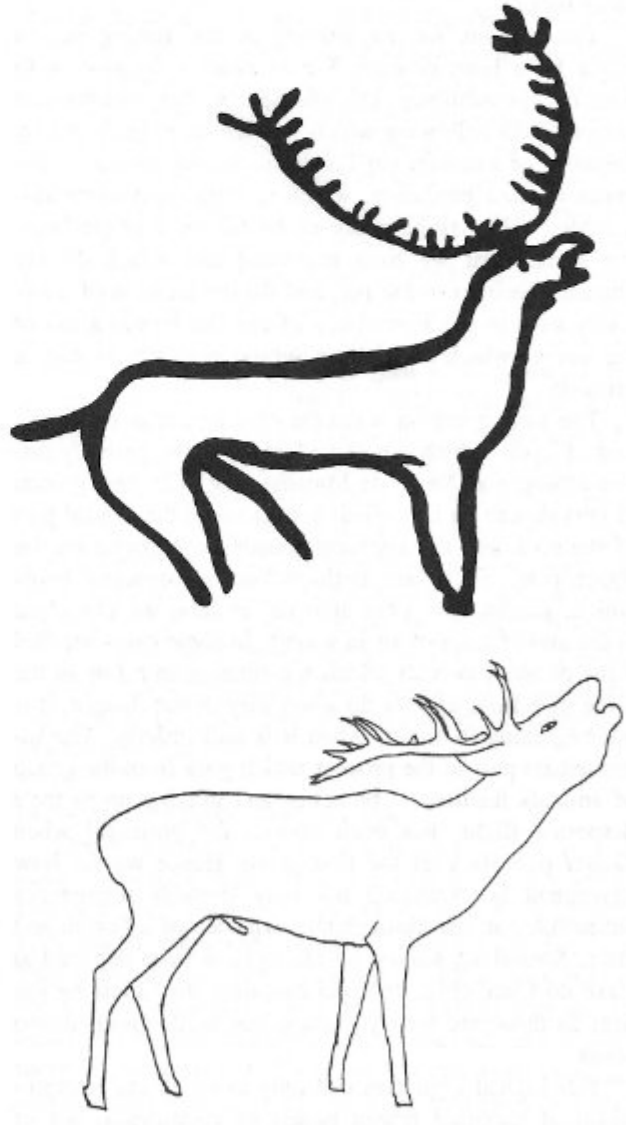

Figure 15. *Great male at Rotea de Mendo, Campo Lameiro.*

For example, the group of cervids 'attacked' in Pedra das Ferraduras could be a stag accompanied by its harem, if indeed they form a scene (Fig. 4). The response of the deer herds to danger converts Pedra das Ferraduras into a scene of possible ethological inspiration. A herd typical of the rutting season, composed of a male, female and yearlings without antlers, always reacts to danger in the same way. With the herd broken up on discovering the presence of enemies, whether they be wolves or humans, the female and yearlings take flight with the male trailing behind. The herd flees uphill attempting to reach open land where its speed will allow it to get away; whether or not it is captured, the male will attempt to save the harem. The prints carved on the upper part of this rock may refer to the abundance with which hoof prints are found in the rutting season. The hillsmen state that an untrained eye would calculate far more animals then there actually were. The wanderings of the male on heat can amount to eighty kilometres in a single day. Groups of a similar composition feature on other rocks.

The reasons for an interest in the rutting season might have been diverse. We consider it interesting to note two possibilities: (a) The spectacular, ostentatious nature of the bellowing which fills the areas inhabited by the deer for a month. (b) The unsuspecting attitude of the males to their predators, which renders them more vulnerable. This may be endorsed by (a) some of the hunting scenes that we have examined and which display attitudes peculiar to the rut, and (b) the location of many rocky sites in the immediacy of the flat humid areas of the sierras which could have served perfectly as rutting grounds.

The rutting season is not the only period in the deer's annual cycle which we can identify in the petroglyphs. For example at Naval de Martiño (Fig. 12), two groups of cervids can be identified: the males on the central part of the rock and the apparent females and young on the upper part. These are perhaps two independent herds which, judging from the animals' antlers, we can place at the end of summer or in winter. In some cases we find three or more cervids which are running in a line in the same direction, as deer do when they detect danger. It is the beginning of flight, when it is still orderly. The intermediate part of the process which goes from the group of animals feeding on branches and grazing up to their desperate flight, has been chosen for portrayal when danger persists after the first chase. Hence we see how movement is expressed not only through segmentary animation but also through the evidence of a before and after. Something similar seems to have been depicted at Laxe do Cuco (Fig. 10), but this time they must be roe deer as these are family groups, not herds grouped into sexes.

Ethological argument can only assist in the interpretation of maximal fifteen panels of zoomorphs, out of more than 120 such panels. The limitations imposed by our Western perception prevent such an ethological approach in respect of the majority of apparent animal motifs (Vázquez Rozas 1997).

People and weapons

The number of anthropomorphs thought to be of the Chalcolithic and Bronze Age amounts to about thirty, counting 'riding scenes'. By their attitudes and attributes all of them appear to be men. They ride, hunt, shepherd, sail and appear armed. So they undertake activities peculiar to the male sex in all mixed-economy societies: pastoral, agricultural and hunting.

The human figures were apparently made to show concrete activities, we always find them performing actions. It is not so much an individual that is represented but a specific activity.

Weapons are not only types of motifs, but a composite theme which is consistently placed on panels on which other motifs are rare. They are of interest because they have been used as a guide to date petroglyphs (Vázquez Varela 1990, 1991, 1995). However, we deal with them here because their composition and distribution seem to have a territorial meaning.

The abundance of human figures performing activities peculiar to men has been interpreted by Vázquez Varela as the work of a profane ideology which affirms and defends the predominance of the male sector in the human groups of the Bronze Age (Vázquez 1991). This interpretation is based on a very frequent function in art — reproducing the social system, serving as an instrument in the hands of dominant groups in order to defend their values. This interpretative hypothesis opens up for us a very interesting line of investigation.

It is possible that masculine values are not only present, but even assume a certain social scale at the end of the Chalcolithic and beginning of the Bronze Age — an incipient social scale which has one of its most striking reflections in the possession of metal objects. The appearance of individual burial rites in cist slabs and differences in grave goods are the first data to suggest social stratification at the beginning of metallurgy. Whether this possession of metal objects is a symptom or a factor, there is ample consensus among investigators about the dating of the beginnings of social scale in western Europe between the Chalcolithic and Early Bronze Ages.

We have apparent evidence of this incipient social scale in grave goods with elements of gold and bronze weapons from tombs like that at Atios, Porriño, and at sites like that Quinta de Agua Branca, Vila Nova da Cerveira, Portugal. Atios' grave goods consist of two spirals and two gold rings, a diadem of the same metal with a zigzag decoration and a bronze dagger or short sword. In the same locality an archer's gold bracelet has also been found. One might interpret similarly the fact that the weapons depicted in the petroglyphs invert the proportions of those which appear in the Galician archaeological context. Galician museum collections have an abundance of axes, fewer daggers and a single halberd. In the rock art there are of 57 daggers or swords, 37 halberds but no axes.

Among the petroglyphs we find some examples in which men's display of weaponry seems to have a differentiating character. At Pedra das Ferraduras (Fig. 4) there are five human figures, four of which are holding an elongated object which might be a throwing weapon or something similar. The fifth, situated above centre, stands out because of its position, but above all differs from the others in that it is bearing a dagger characteristic of the early Bronze Age (Peña and Vázquez 1979; Vázquez Varela 1991; Vázquez Rozas 1997). We commented above on the apparent hierarchical perspective which justifies the enormous relative size of the weapon. However, we wish to point out that it also functions as a symbol or factor to differentiate this human figure from others, revealing, perhaps, the same social scale which is interpreted in funerary contexts.

However, weapons in the hands of anthropomorphs do not appear to be represented with such clarity in any other case. Even in 'riding scenes' they all carry elongated objects which might be weapons. There are two intermediate cases between the anthropomorph with dagger at Ferraduras and all the others. These are the humans at Outeiro do río Loureiro and Monte Tetón (Fig. 16). In these two cases, the display of weaponry might also be interpreted as a differentiator. In Monte Tetón, the anthropomorph is so laden down with weapons that it is difficult to imagine him using them all at once. He appears to be showing off his might as a warrior, a power that comes to him from the weaponry he has amassed and which serves to demonstrate his social standing. He carries a 'dart' or a 'quiver' on the right shoulder, a 'mace' hung on the elbow and a 'shield' on the left arm. Round maces have been found in Galician Chalcolithic context (Bello et al. 1987).

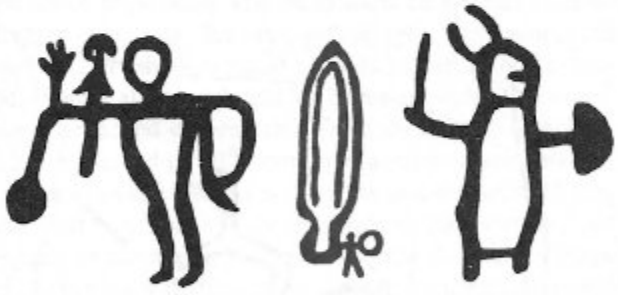

Figure 16. *Human figures at Río Loureiro, Cangas do Morrazo, and Monte Tetón, Tomiño.*

As the Bronze Age advances the use of metal spreads and it loses its character of the status indicator it had at the beginning of metallurgy. Archaeological interpretation seems to indicate that it is no longer the display but the amassing of metal which interests the elite (Renfrew 1986). Among the petroglyphs attributed to this time there is an apparent disappearance of the representation of weapons at a size equal to or greater than life size. Nevertheless, riding scenes which are possibly motifs of a more modern chronology, because they never coincide with weapons which are characteristic of the early Bronze Age, appear to develop. It might be a worthwhile line of investigation to suppose that the riding scenes reflect a new way of expressing the warrior's function and even social scale.

To begin with, we must expect an artistic phenomenon continuing over a thousand years to have adapted to ideological changes in order to remain in existence, and to disappear when new formal instruments supplant its role, transmitting the new contents with greater success. If the late development of riding scenes is a fact, this iconographical change might reflect the adaptation of themes to social changes.

The distribution of petroglyphs with apparent weapons is characterised by two tendencies: in the first place, in each region the 'weapons' are concentrated in a single or two neighbouring sites, above all when we focus our attention on 'halberds' and sword-shaped carvings with a cross inscribed. Secondly, panels with weapons grouped together, like at Pedra das Procesions (Fig. 9), are located on the limits of the distribution area of the petroglyphs. How can we interpret this? Are they, by chance, places which have greater conflict potential and require rituals of warlike display? They may have marked the limits of different communities. When we plot the distribution map do we see part of the limits of a territory whose inhabitants were united by some type of bond?

Another two arguments reinforce this question. The 'weapons' depicted in Pedra das Procesions and other similar rocks seem to be raised in the hands of warriors who are not depicted. This idea is based on the psychology of vision which demonstrates experimentally that humans tend to portray objects just as they are used to seeing them (Arnheim 1974, 1982). The weapons at Pedra das Procesións might be with the bearers taken for granted, held up like the anthropomorph's dagger at Pedra das Ferraduras. The number of weapons at Pedra das Procesións and, therefore, the number of warriors bearing them, coincides with the proportion of adult men in the population calculated for the valley overlooked by Pedra das Procesións in the Early Bronze Age (Vázquez Varela 1995). It is, therefore, probable that part of the images of weapons might have functioned as territorial markers and places where warrior rituals were held (Vázquez Rozas 1997).

Quadrupeds and concentric circles

One of the first features which attracted the investigators' attention was the association between cervids, circles and concentric circles. In our data base of 1006 rock panels, apparent cervids are present on 124, and they coincide with concentric circles on exactly half of them. This is the motif they are most frequently associated with, slightly outnumbering cupules which are much more frequent overall. These associations between quadrupeds and circles can be classified into three essential types:

(a) In the first the animal is joined by its back to the geometrical shape. On occasion it seems to be pulling the circular shape; on others it appears to emerge

from it.

(b) In the second, one or more quadrupeds surrounded the concentric circle, sometimes with antlers, sometimes together with several animals, others touching it with the head.

(c) The third type is the most diverse and is formed by close juxtapositions in which the circle is usually placed before or on top of the animal.

Evaluating the role which quadrupeds play in these associations, though neither easy nor reliable, is more readily feasible than interpreting the possible significance of the circular shape. We can guess the species of quadrupeds, the behaviour represented, the stylistic group etc. The possibilities are numerous for the circles and concentric circles. Our perception, accustomed as it is to Euclidean geometry, is reluctant to accept the circular shape as a means of representing numerous referents, even of many that are found very distant from the circle and the sphere. However, we use them frequently on paper as we try to explain a space or an idea (Arnheim 1974).

There are numerous possible natural referents of the circle and concentric circle, but we should add to this list any idea which might need formal materialisation in an explication. There is no critical instrument which might allow us to rule out some and arrange other interpretations into degrees of probability. Nevertheless, it is possible to establish categories of meanings for the circle and concentric circle in petroglyphs, even though we can only achieve a very generic division:

(1) The symbol of an idea or abstract concept.

(2) The representation of a movable or apparently movable object.

(3) A reference to one or several elements of the landscape.

The latter two do not exclude the first, as a movable object or an element of landscape can also be a symbol of an abstract concept. In the types of associations which we shall consider, each of these categories can be shown as more probable then another.

Group IV at Monte Ardegán (Fig. 17) is an example of a quadruped that appears to be pulling a circle. This does not seem to be a reference to the landscape, but rather a way of linking an idea or an object to the animal.

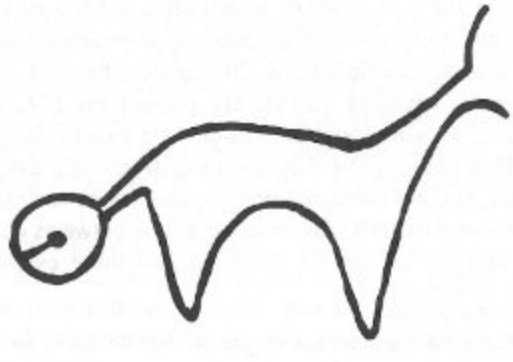

Figure 17. Group IV at Monte Ardegán, Moraña.

The theme of a horse pulling a solar disc is illustrated by the Trundholm cart, Copenhagen Museum, Denmark, dated to about 3600 BP. With a similar chronology we find the Strettweg cart, Eggenberg Museum, Graz, Austria, with two representations of deer, among other figures. These are parallels which are too distant in space to be applied to Galician petroglyphs, though the theme of the sun cart occurs widely through Eurasia, from Scandinavia to India, and through to classical Greece.

Even though we are unable to confirm it, we should not reject the idea that some of these images might represent the quadruped pulling a solar disc, perhaps an expression of the worshipping of the sun and fire which helps to smelt metals. New discoveries of petroglyphs and silver smithery in the north-west of Spain might possibly shed light on this topic.

The importance of representations of the sun in the Galician megalithism is verified by several sun-shaped representations carved on Galician megaliths. The majority orientation of the corridors of megaliths towards the rising sun points in the same direction. This orientation is present in some petroglyphs as significant as Pedra das Procesions. The absence of sun-shaped motifs in the petroglyphs contrasts with this tradition and might be hiding the possibility that some of the circles and concentric circles are representations of the sun.

The petroglyphs at Os Campos (Fig. 18) illustrate the theme of several quadrupeds surrounding a concentric circle. In this case, in the above three groups of meanings considered for concentric circles, there does not appear to have been a desire to represent an object since the animals are distributed near to the concentric circle as if it were a projection perspective. Is this a landscape reference or an abstract symbol? These possibilities are not mutually exclusive.

Figure 18. Quadrupeds surrounding a concentric circle at Os Campos, Rianxo.

As in the previous case, the possibility that some concentric circles represent water has been considered by almost all researches to have visited the petroglyphs (Peña Santos 1998). There are, in fact, some arguments which may point in this direction:

(1) The place-names referring to water in a considerable number of petroglyph sites.
(2) The location of many petroglyphs at the edge of grazing areas that become waterlogged when it rains.
(3) The shape of concentric circles which resemble, even in their relief, concentric waves of water.

In all the representations of this theme, the concentric circles are situated on an inclined area of the rock. This position is contrary to normal since the majority of geometric motifs are placed on flat, horizontal areas of the rocks, an effect which is used for the projection perspective of the quadrupeds.

Whether or not it was water which was represented in these concentric circles, the apparent effect is that of a fragment of landscape represented in projection perspective, around which several quadrupeds move. In some cases they even appear to drink water.

This reading of shapes is hypothetical. What does appear to be evident is that this was a theme, captured on diverse occasions, consisting of several quadrupeds arranged about a concentric circle. Similarly, it seems that concentric circles and circles had different meanings in different cases. They may have been a resource for representing ideas and diverse realities.

Conclusions

The study of themes and iconography is a slippery terrain in an art whose oral tradition has been lost and which did not have written texts. We are moving in the terrain of hypotheses and these must be set forth according to the data that the petroglyphs, archaeological context and ethnographical records placed at our disposal. Above all they should be coherent with each other. We approached our research from these starting points. It has presented us with more questions than answers.

Art does not 'reflect society' as one frequently hears and reads, but commonly responds to the interests, not explicit in the majority of cases, of the dominant ideology, to the point that the survival of some themes depends on the maintenance of the ideology which art collaborates in endorsing. The evolution of ideology is behind the majority of iconographical changes (Panofsky 1962; Gombrich 1979). This may be the reason why apparent weapons and riding scenes never coincide on the same petroglyph.

Of the possible human activities the petroglyph makers selected those we regard as typical of the male: hunting, war and cattle-farming — probably the most prestigious though not the most productive activities (Harris 1971). Art compensates for this imbalance between prestige and economic importance so that society accepts a scale of values which conditions the producers.

As for the existence of a 'true iconography' (as perceived by a modern European) which responds to a concrete theme, we have seen that the fewer components an apparent scene possesses, the less we find it repeated and the less likely it is that it responds to a standardised content. That is, only in the case of complex scenes which are contrasted with other examples, like that at Pedra das Ferraduras, can we be sure that we find ourselves before an oral theme of wide distribution and limited survival. If the iconographic content of the hunting scene is inferred indirectly and is therefore debatable, we can delve with even less justification into the contents of possible stories or myths which might have given rise to other themes that we introduce here; they could also have been the product of chance or of resorting to simple formal means and scant repertoire.

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Résumé. *Cette étude résume les recherches de l'auteur sur des gravures de Galice (nord-ouest de l'Espagne), que l'on pense dater du Chalcolithique ou de l'Age du Bronze. Elle débute par un bref historique des recherches dans cette région. On traite ensuite des divers critères utilisés pour la datation, en discutant leurs caractéristiques techniques et leur distribution géographique. L'exposé aborde ensuite l'analyse interne des compositions rupestres, les relations entre la forme et le support rocheux et la représentation de l'espace et du mouvement. On conclut par une discussion détaillée de l'iconographie et des principaux thèmes repérés à ce jour.*

Zusammenfassung. *Diese Studie faßt die Forschung des Autors von Petroglyphen in Galicia, Nord-West Spanien, die als chalkolithisch und bronzezeitlich gesehen werden, zusammen. Sie beginnt mit einem kurzen historischen Rückblick der Forschungstradition in diesem Gebiet. Die Kriterien für das Datieren der Petroglyphen werden dann besprochen, sowie ihre technischen Merkmale und geographische Verteilung. Die Darlegung setzt mit der inneren Analyse der dekorierten Felsen fort, der Beziehung zwischen Form und Felsfläche, und der Darstellung von Raum und Bewegung. Sie schließt mit einer ausführlicheren Diskussion der Haupt-Themen und der bisher entdeckten Ikonographie.*

Resumen. *Este estudio resume la investigación del autor de los petroglifos en Galicia, al Nor-Oeste de España, considerados como correspondientes a las edades del Chalcolítico y del Bronce. Comienza con una corta revisión histórica de la tradición de investigación en esta área. El criterio usado para fechar los petroglifos es comentado, así como sus características técnicas y distribución geográfica. El artículo continua con el análisis intrínsico de las rocas decoradas, la relación entre la forma y el soporte, y la representación de espacio y movimiento. Concluye con una discusión más detallada de los principales temas y la iconografía decubierta hasta la fecha.*

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RAR 16-500

BRIEF REPORTS

'Bradshaws' — an eastern province?

PAUL S. C. TAÇON, KEN MULVANEY, RICHARD FULLAGAR and LESLEY HEAD

Since the 1994 publication of Grahame Walsh's *Bradshaws: ancient rock paintings of north-west Australia* there has been much debate about the origin (Barry 1997; Lewis 1997; Walsh 1994; Welch 1996), age (Roberts et. al 1997; Watchman et al. 1997), distribution (Taçon et al. 1997; Walsh and Morwood 1999), meaning and significance (McNiven and Russell 1997; Taçon 1999; Welch 1996) of these ancient figures. The oldest Bradshaw paintings, also known as *Gwion Gwion* by Ngarinjin people, may be over 17 000 years of age if experimental results from the optical luminescence dating of a mud-wasp nest that overlies a Bradshaw-like figure are proven accurate and are repeatable (Roberts et al. 1997). However, they might be considerably younger or, at least, made over many millennia. Indeed, there are recent age estimates from 1500 years ago to more than 4000 years, based on AMS radiocarbon dating of accretionary deposits containing oxalates, diatoms and algal remains that were found overlying and within Bradshaw paintings (Watchman et al. 1997). Importantly, Bradshaws are found early in Kimberley rock art sequences, as determined by superimpositioning at numerous sites, something consistently noted by different researchers (e.g. Taçon et al. 1997; Walsh 1994; Welch 1993, 1996).

In terms of distribution, Bradshaws are primarily a feature of the west and central Kimberley, as the most recent published map indicates (Walsh and Morwood 1999: 46). However, isolated Bradshaws have been noted in the Napier Range, south-west of Wyndham and in the Keep River region of the Northern Territory (see Taçon et al. 1997: 958-9). The most eastern site, Granilpi, contains many forms of painting and petroglyph but only two life-size faint Bradshaw figures, painted as a pair. Until July 1999, these two appeared to be extremely isolated eastern examples, perhaps one-off occurrences. However, recent field survey uncovered five more locations at which Bradshaw paintings were recorded. These sites are within the eastern portion of the Weaber Range and the Goorurarmum hill complex, south of the Marralam Aboriginal Community, an area bisected by the Keep River. This region, that geologically/geomorphologically could be classed as eastern Kimberley rather than north-western Victoria River region, is an area that potentially contains many more Bradshaw figures along with other unrecorded yet important archaeological sites (further field work in 2000 will focus on surveying and recording these areas more completely). The recently recorded sites contain many examples of different kinds of Bradshaw figures as well as associated animals, hand stencils and abstract signs. It is believed there is now enough evidence to argue for an eastern province of Bradshaw and related figures within the lower Keep River area. Given the international interest in this art form, presented here is a synopsis of what has so far been recorded. A detailed analysis awaits next season's field work.

For the most part, Bradshaw figures of the west Kimberley are small, 30-50 cm long, and commonly in rigid or static poses. Sometimes they appear to float, glide or hover — as if they are somehow suspended in air. Most are in a shade of red, often a deep mulberry colour, but others were made with white or yellow in combination with the red. Sometimes animals such as possums were painted near the heads of figures. Importantly, Bradshaw figures are invariably depicted with lots of material culture items — generally objects that do not preserve well in the deposits of north Australian archaeological sites. Boomerangs, barbed spears, armbands, belts, bags, strings, skirts, hats, headdresses, tasselled objects and other forms of elaborate body adornment are common (Walsh 1994; Welch 1996).

The Keep River Bradshaws are in red, mulberry and purple. To date, 18 individual figures, present at six locations, have been recorded. They consist of both life-size figures and some that are less than 50 cm in length. Paintings are present on the rockshelter walls, either adjacent to more recently produced art, or on panels or rockshelters in isolation from other paintings. Within this Bradshaw grouped art, there are a number of associated anthropomorphs, hand stencils, hand prints and animals. That is, they are spatially referenced or apparently produced using the same ochres. Representations of animals include an 'echidna' seen from above (rather than in profile as with more recent Keep River rock art), a life-size outline macropod, three python-like snakes, a 'freshwater crocodile', a 'possum' and 'eel-tail catfish'. At two sites there are superimpositions of Bradshaw figures over each other. At one of these, purple Bradshaws are also under or over several purple animals. There also is a Bradshaw over a purple hand stencil at the second site. Most paintings (e.g. Figure 1) resemble 'tasselled' Bradshaws, considered the oldest Kimberley depictions of humans (Walsh 1994; Welch 1993). But

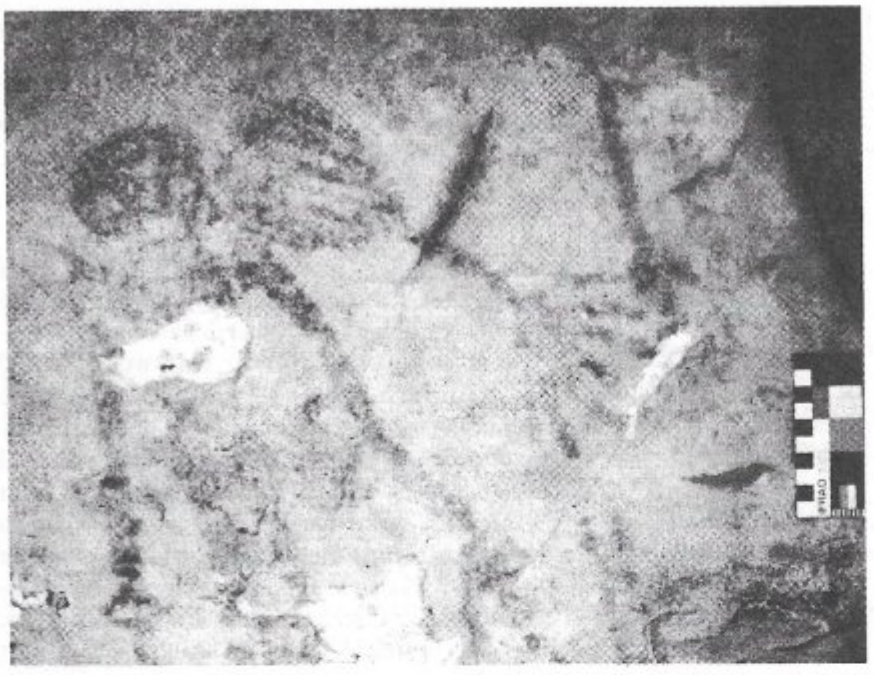

Figure 1. Close-up of the head and upper body of a figure classified as a 'tassel Bradshaw' by Walsh (1994) or 'tasselled figure' by Welch (1993) from one of the east Kimberley sites and similar to that shown in plate 36 of Walsh 1994. This is one of the earliest in both the Walsh and Welch sequences.

some east Kimberley figures appear stylistically different from those of the west Kimberley. These differences need to be tested through further fieldwork and statistical analysis. We also need to test the hypothesis of an eastern province for both the Bradshaw and subsequent periods.

For instance, during the period in which Bradshaw paintings were made, human figures became the dominant subject (Walsh 1995; Welch 1993, 1996). There are many similarities with the 'Dynamic Figures' of Arnhem Land (Barry 1997; Lewis 1997; Taçon 1999) and a few pockets of similar 'old-looking' human figures from the Daly River (C. Chippindale, pers. comm.). Some life-size figures from the Keep River region are also reminiscent of rare Arnhem Land large naturalistic figures, including a depiction near the Mann River in central Arnhem Land (e.g. Chaloupka 1993: 83; Taçon 1993: 54). Research to date suggests Keep River region rock art has had many influences, from the west, south and east, throughout its development. Another hypothesis to test is whether the eastern Bradshaws have links with both the west Kimberley and Arnhem Land. This was first suggested by Lewis (1988: 84-5), who hypothesised 'that both art regions were once part of a single late Pleistocene/early Holocene information network' (1997: 1). Significantly, the Keep River sites lie in the middle of Lewis' 'Bonaparte catchment', an area he contends links 'Bradshaw' and 'Dynamic art'.

Besides more survey, analysis and recording of rock art, new excavations are planned for two sites with Bradshaw paintings, including directly below the most complex panel yet recorded in the Keep River region. Among other things, it is intended to better understand landscape and resource utilisation over the period Bradshaw paintings were made, as well as to define subsequent change. Importantly, in recent times major polychrome ceremonial figures were added to the rock walls on which some of the Bradshaw paintings exist. This recent art work is very different from Wandjinas and other Kimberley rock art, however, there are similarities to depictions further east (e.g. Mulvaney 1996: 10-13). By way of excavations, palaeo-environmental data and further rock art recording, it is hoped to obtain a comprehensive view not only of the inter and intra-site spatial organisation and cultural cohesion of the people that produced the Bradshaw figures in this region but also of the more recent changes.

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RAR 16-501

Obituary on Wadi Sora?

FRIEDRICH BERGER

Wadi Sora is a rock art site at the western flank of Gilf Kebir, a mountainous range in south-western Egypt. It is famous for the supposed depictions of 'swimmers in the desert' (Figure 1).

Figure 1. *Rock paintings of supposed swimmers, Wadi Sora.*

The first petroglyphs at this site were discovered by P. Clayton in 1931. In 1933 Almásy found two caves with paintings and called the location Wadi Sora (or Sura) = 'picture valley' (Almásy 1936: 68-9,78; 1940: 128; 1998: 179, 321). The paintings and petroglyphs were recorded by the Frobenius expedition of 1933-35, with Almásy as a guide (Frobenius and Rhotert 1934; Rhotert 1952: 2, 52-70, Pls 28-35). According to Almásy the caves have developed from wells, i.e. water outlets in soft sandstone where it overlies impermeable hard rock (Almásy 1998: 321; Rhotert 1952: 53). The surface of the rock in the caves was covered by rock varnish during a more humid climate. The paintings were applied to the surface of the rock varnish.

Natural destruction of the paintings has long been active. The millimetre-thick hard rock varnish is exfoliating from the softer sandstone below. This was already reported by Rhotert (1952: 53, 54). Destruction by humans began immediately after the discovery by Europeans. Rhotert mentioned (1952: 53) that the paintings were treated with water in order to make the colours better visible for copying and photographing. Such a procedure was not unusual at that time.

Because of their beauty and the easy access the paintings had many visitors, e.g. Bagnold and Peel in 1938 (Bagnold 1939: 286). During World War II the explorers of that area found themselves on different sides. Bagnold (1987: 285-8) became the leader of the Long Range Desert Group (LRDG) which was supported by the SAS and men from New Zealand. Their traces can be found in Wadi Sora on the walls. Figure 2 shows the names of Burton, R., RA and of J. L. Davis, 1940-41.

Figure 2. *Graffiti, World War II, Wadi Sora.*

Figure 3 is an inscription of A. T. Ball (?), RAF and W. Forbes, NZEF, 1941, LRDG.

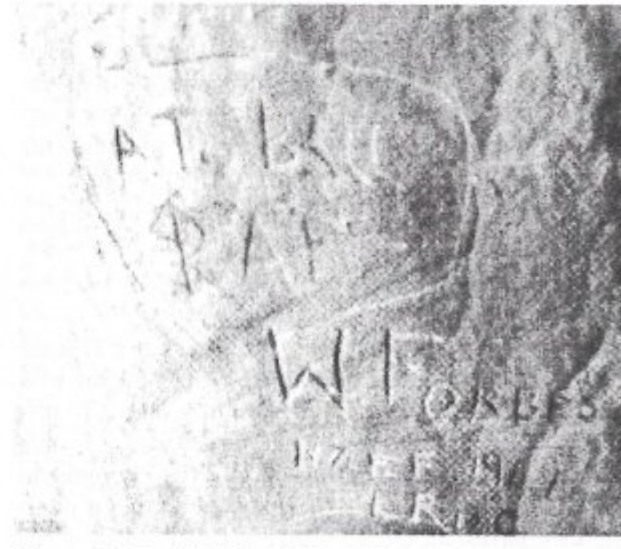

Figure 3. *Graffiti, World War II, Wadi Sora.*

Later Kufra was supplied from Wadi Halfa via Gilf Kebir (Almásy 1998: 19, 354). On the other hand, Almásy visited Wadi Sora in 1942 with two German spies whom he brought from Gialo in Libya through Gilf Kebir to Assiut at the Nile.

After World War II Wadi Sora was visited by researchers working in that area and by individual travellers. Few left their names on the walls, e.g. one in 1969 close to the remains of a painting (Figure 4).

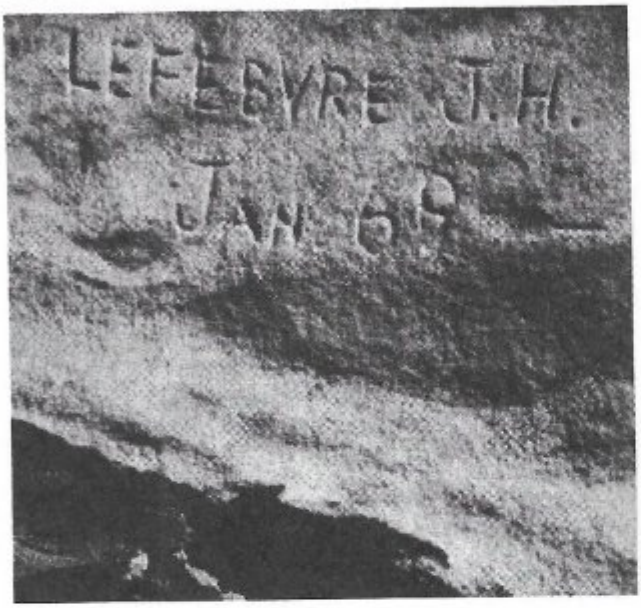

Figure 4. Graffiti of 1969, Wadi Sora.

To my knowledge only one tour operator, from Germany, arranged visits to southern Egypt, including Wadi Sora, during the last 20-30 years and I am not aware of graffiti of these tourists.

The situation changed recently for two reasons:

(a) Close to the 100th anniversary of Almásy's birthday in 1995, the book and the film *The English patient* attracted much interest. Actually the book (Ondaatje 1992 in English, 1993/97 in German) is a work of fiction around a few facts, and the film was not made in Egypt but in Tunisia and Algeria. Besides that, in 1997/98 the German version of Almásy's book of 1939 was re-published with amendments from the Hungarian version of 1934 and inclusions of his diary of 1942. Both publications increased interest in the area.

(b) With the availability of Russian maps (up to 1 : 100 000) and the American GPS instruments navigation in the desert has become much easier. Also, Egyptian tour operators now visit Wadi Sora.

The most recent inscriptions, from 1998 (e.g. Figure 5) are probably to be assigned to these new tourists who followed the bad examples of earlier visitors. If this activity remains uncontrolled the old paintings may become the background behind the modern inscriptions. The paintings on the fragile support may also be damaged themselves. In order to get this development under control Kröpelin (1997) has proposed the creation of a National Park for the area of the Gilf Kebir which includes several other rock art sites besides Wadi Sora.

Figure 5. Graffiti of 1998, Wadi Sora.

Of course, the establishment of a National Park would be an ideal solution. Under such an umbrella the environment in general and rare plants and animals could also be protected. As the Gilf Kebir covers an area comparable to Switzerland and as the nearest settlement in Egypt is 400 km away the administration of a National Park would require enormous amounts of funding. In future there may also be a conflict with other activities. In 1998 a geological reconnaissance searching for water was conducted in the area, probably as part of a joint Libyan-Egyptian effort for the development of southern Egypt (Anon. 1999).

As a first step for the protection of the rock art sites it would be helpful if the Egyptian authorities would introduce obligatory training for tour guides with respect to the protection of the environment, of archaeological sites, and of rare animals and plants. For such a training international technical support may be necessary.

Exfoliated pieces of rock varnish with paint residues may be suitable for dating and the dated inscriptions may represent a base line for dating other petroglyphs on similar rocks.

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RAR REVIEW

Lost civilisations of the Stone Age, by RICHARD RUDGLEY. 1998. Century, London. Comprises 308 pages, 40 drawings and 28 monochrome plates, bibliography, index. Hardback, £17.99, ISBN 0-7126-77585.

There has been no shortage in recent years of books synthesising issues of hominid development, be it physical, cognitive or technological, but many of them follow the by now well-trodden path of the short-range determinist model epitomised by the African Eve and the cultural Big Bang on the first day of the Aurignacian. It is therefore particularly pleasing to find a book about Stone Age sophistication that is as thoughtful and as well researched as Rudgley's.

His book's central message is easily summarised: the people of the Palaeolithic, Mesolithic and Neolithic periods were considerably more advanced, especially technologically, than orthodox archaeology tends to give them credit for. There should be no doubt that Rudgley is on the right track here, however much his work stands against the current of mainstream archaeological thought. His book examines a series of issues organised by chapters: archaic proto-languages, the origins of writing, palaeoscience, early surgical techniques, heat treatment of stone and clay, stone grinding and drilling, mining technology, ochre use, the female figurines, the collection of crystals and fossils, portable engravings, and the old problem of discriminating between stone tools and geofacts or other naturefacts.

An issue also briefly touched upon is the tendency of many people to search for extraterrestrial explanations for certain phenomena in archaeology and rock art. This is quite central to the generic problem Rudgley seeks to address. Traditional archaeology operates on minimalist interpretations of taphonomically skewed and heavily distorted samples, providing excessively conservative deductions not out of rigour, but because the phenomenon of taphonomic lag is not understood. These inherent distortions are systematic, they apply right through the spectrum of archaeological interpretation. The only way to resolve them simplistically is to appeal to 'catastrophic' or punctuated equilibrium explanations, such as the African Eve model: there must have been incredible explosions of cultural abilities occasionally, quantum jumps in human development, 'bottlenecks' or 'bottle corks' in genetic dispersal and so forth. This is the only explanation minimalist archaeology can offer for such phenomena as Chauvet Cave, Neolithic brain surgery or the decorated Pleistocene pottery of Japan.

The interested public has long realised that the most ardently promoted archaeological fables are unconvincing, and since archaeology has so far offered nothing more sensible to explain the 'sudden' appearance of sophistication at various times in human history, the public has looked for (and frequently favoured) a variety of alternative explanations, usually involving aliens, or the mythological inhabitants of Atlantis, Lemuria or Mu, as Rudgley notes. This is sometimes called 'folk archaeology' by archaeologists lamenting the dissemination of such alternative fables, apparently without realising that it is they themselves who prompt these mythologies: if archaeology provided convincing explanations rather than false or unconvincing ones, the public might be more likely to take them on board.

Bearing in mind that the key to a profoundly better understanding of archaeological data, taphonomic logic, has been available for some years now, there is no reason to pull any punches here. If archaeology continues on its traditional course of providing false explanations of the human past it has no reason to be critical of folk archaeology. According to taphonomic logic, which is scientific rather than archaeological, all archaeological data refer to the surviving remnants of cumulative populations of entities that have been subjected to continuous degradation which selects in favour of specific properties facilitating longevity. So it is pointless to concede the advent of textiles (or painting, or cordage, or whatever else) for the time of their first appearance in what is euphemistically called the 'archaeological record' (a nonsensical phrase that means in fact nothing).

My only real quarrel with Rudgley's otherwise superb book is that while he defines and describes the problem so admirably, he does not attempt to explain it, when it can so easily be explained. Let us take the example of textiles just mentioned, which is one of the technologies Rudgley mentions only briefly: until very recently, we had only two finds of Pleistocene cordage, from Lascaux and Ohalo II. With the discovery of many types of weaving patterns at Czech Gravettian sites it has become apparent that a developed industry of this kind had been developed by the early Upper Palaeolithic. It would be just as wrong to deduce the time this technology first appeared from this as it would previously have been to claim that there was no textile technology at all in the Pleistocene. The fact of the matter is that textiles are a class of remains whose taphonomic lag can be assumed to be well above 90%, which means that they appeared long before physical evidence of them does in any significant quantity. Archaeology has misread 'taphonomic thresholds' as advents, and tried to explain the earlier 'fluke' occurrences away as a 'running ahead of time'. This is the most fundamental statement we can possibly make about orthodox archaeology.

The way to deal with this dilemma is to focus on classes of evidence with very short lag times, and extend from the insights they permit to areas not accessible by evidence. For instance we have many Acheulian objects which most people would regard as perforated beads. It is a reasonable deduction that they involved the use of cordage and of knots. Similarly, we have secure evidence for up to twenty Pleistocene sea crossings, reaching back to the Lower Palaeolithic in two regions, the Mediterranean and Indonesia. It is a reasonable deduction that they involved watercraft, and thus cordage and knots. We have no hope of ever recovering rafts from the Pleistocene, even though we can assume that they were used for about a million years. We are dealing with a phenomenon that happens to have a 99% taphonomic lag. If archaeology refused to accept this, then we would need to ask what evidence archaeologists have that *Homo erectus* possessed soft tissue. It would be fundamentally inconsistent, illogical and even hypocritical, to accept a perfectly reasonable uniformitarian deduction in one case, but not in the other, just to uphold a false dogma.

Cordage is not the only class of evidence for which we need to assume a historical duration of many times that conceded by orthodox archaeology; the same applies in fact to most classes of evidence. Pleistocene archaeology has effectively accepted a massively distorted record as being a reflection of the live system that created it. This was a fundamental error, and the interpretational distortion caused by it is probably very much greater than Rudgley conveys. We were not wrong by factors of two or three, or even five, but in many areas by factors of between 20 and 100! This is a fair indication of how badly Pleistocene humans have been misjudged, and why it is best to disregard all archaeological models of the period completely. Most are not worth salvaging.

This is where I differ from Rudgley: he would advocate a relatively marginal correction of the existing models, pushing certain limits back by a few millennia here and there, perhaps even ten or twenty millennia. I perceive the existing models as so fundamentally and systematically flawed that I see no value in trying to salvage any part of them, and would prefer to start afresh. If a particular technology, such as seafaring, is not, as the textbooks claim, 8500 years old, but almost a million years, what point is there in adjusting and 're-tuning' a fundamentally flawed model? It can only spawn further false models, because all our *implicit* assumptions are still based on the fallacious paradigm that has dominated archaeology for almost a couple of centuries.

Time will show, however, that Rudgley's incremental corrections are more effective than my revolutionary ones, because of the extreme conservatism of archaeology: incremental and marginal changes can be accommodated, ever so slowly, but a shift of paradigm is out of the question in this unfalsifiable discipline where prestige always comes before veracity. What most other disciplines have accomplished without too much agony would be intolerable for this 'consensus mythology' of the past, as Bahn has aptly called it, which we call an archaeology. Therefore the hare in me may find Rudgley's tortoise approach too slow, but deep down I know that he is completely right: a step at a time will get us there. Very slowly. Rudgley's corrections are just within the limits of what this dinosaur of a discipline might be able to digest, any more of the good medicine and our upholders of the dogma would predict mayhem.

Richard Rudgley's book is a goldmine of information about the many aspects of archaeology which the advocates of the currently dominant models have made every effort to suppress, particularly in the Anglophone literature where African Eve has reigned supreme until now. If there has been a cork on the bottle of human evolution, as Clive Gamble once put it, it has been this campaign by the great shamans of archaeology to reject and suppress the kind of data Rudgley has assembled. Now the genie is out of the bottle.

R. G. Bednarik
RAR 16-503

Human evolution: a neuropsychological perspective, by JOHN L. BRADSHAW. 1998. Psychology Press, Hove, U.K. xii + 235 pages, monochrome plates and line drawings, bibliography, two indexes. Hardback, £39.95, ISBN 0-86377-504-7.

Professor Bradshaw has addressed this general subject before, and to the considerable profit of the reader. As a neuropsychologist with a major interest in palaeoart he offers a perspective that is of particular relevance to the evolution of human cognition. His attempt to cover, on just around 150 pages of actual text, everything from the formation of the Universe and the Earth to the consciousness and self-awareness of modern humans might seem a little ambitious, but it is a fair indication of the author's breadth of knowledge that he succeeds remarkably well in presenting a very condensed, but nevertheless admirably complete story of the processes that led to the evolution of humans.

After reviewing the appearance of life, of mammals and of primates, the evolution of the genus *Homo* leads to the topic we are primarily concerned with here, palaeoart, and it is in this section of the book that its few weaknesses seem to be located. They are already evident from the frontispiece, which shows a section of the cupule-covered wall of the Jinmium site in the Northern Territory. The caption attributes an age of >58 ka to the cupules and describes them as 'perhaps the world's oldest parietal art'. There are three flaws in this statement: the dating was always rejected by most Australian archaeologists and archaeometrists, and their extreme scepticism has since been amply vindicated: the cupules are less than 10 ka old, as OSL and ^{14}C dating have conclusively shown. Secondly, the world's oldest rock art is unknown, and will presumably always remain so, we can only deal with the world's oldest *known* rock art. Thirdly, rock art older than 58 ka is known from various sites, and that of Auditorium Cave must certainly predate the known arrival of humans in Australia, hence it seems pointless to expect any rock art in Australia to be 'the oldest'.

The section on art contains a number of questionable points and inadequate statements, several of which seem to stem from following the ideas of Randall White. For instance there is the idea that the Châtelperronian Neanderthals acquired cultural elements and ornaments from 'anatomically modern' humans, which has always been absurd: why would non-symboling creatures scavenge symbolic artefacts, and what precisely would they do with them? Eat them? D'Errico's recent work on this subject would render it more likely that the moderns learnt from the Neanderthals. And *contra* Bradshaw, we have no evidence that the moderns arrived 40 ka ago in south-western Europe, we have no such skeletal finds before those from Cro-Magnon. Bradshaw has made the common mistake of confusing skeletal architecture with culture and technology, which mars most discussions of this subject. Nothing we know of indicates that any contemporary 'moderns' and archaic sapienoids had appreciably different cultures. They shared Middle and Upper Palaeolithic technologies and they existed alongside each other (in the Levant, Maghreb, various parts of Europe, south-east Australia ...), so cultural divisions do not coincide with those the physical palaeoanthropologists would like to perceive. And what evidence is there of any large-scale population movement into Europe at that time, considering the copious finds of intermediate human features from right across Eurasia? For instance the currently known perhaps earliest partly modern human remains in Europe, those from Crete, have clear Neanderthal features, which means that intermediate humans (combining Neanderthal and modern features) where highly accomplished mariners some 50 ka ago. That simple detail places a very different slant on this entire issue. Even the concept of Upper Palaeolithic technology is itself dubious, all 'U.P. technologies' occur earlier, so this is a gradual rather than sudden change concerning certain technological emphases. Most certainly the idea of an invasion of technologically superior moderns is entirely baseless.

Bradshaw thinks the art in Altamira and Lascaux is in excess of 15 ka old. That does not seem to be the case at the first site, and the Lascaux art is undated, with much of it quite

probably being of the Holocene. He says that the earliest art in Europe is no more than 43 ka old, citing the beads and pendants of the Aurignacian, but ignoring that we have had beads of the Lower Palaeolithic in several countries, including two European countries, for many decades. Again he relies far too much on White's views which have been solidly rebutted.

There is also a number of inconsistencies and self-contradictions in this part of the book. For instance on p. 48, all kinds of weapons for killing at a distance are said to first appear with the Upper Palaeolithic, but on p. 63 the author admits the technological sophistication of the 400-ka-old Schöningen throwing spears, and on p. 66 he acknowledges the bone harpoons from Katanda. We have in fact Lower Palaeolithic spears or spear-like remains from no less than seven European sites. Bradshaw mentions the bituminous remains on two flakes from Umm el Tlel, but omits the significantly better evidence of resin use from such sites as Königsaue, Kärlich and Bocksteinschmiede. It is clear that Bradshaw's account suffers from his frequent consultation of inadequately informed authors.

These are relatively minor matters, although they can have far-reaching effects on our views. A more fundamental issue concerns Bradshaw's frequent reference to Lower and Middle Palaeolithic aesthetics. In a neuropsychological context, a proper analysis of our thoroughly anthropocentric sense of beauty would be of great interest: why do certain arrangements of sensory data please humans? It seems to me that to do that, they must first come to exist, and where they are artefacts that means these must first be made and valued, and in time appreciated. Would they be perceived 'aesthetic' by intelligent creatures from another universe? I think not. Surely then aesthetics relates to properties that are human constructs resulting from the production of non-utilitarian entities, i.e. palaeoart came before aesthetics. It is then not very helpful to speak of aesthetics during the Lower and Middle Palaeolithic, thereby implying a boot-strap explanation for art origins. If we use the word 'aesthetics' in a Palaeolithic, or indeed any scientific context, we need to define it in a fashion comprehensible to intergalactic visitors. I think it is so hopelessly tainted by anthropocentrism that it has no scientific relevance.

R. G. Bednarik
RAR 16-504

RECENT ROCK ART JOURNALS

Rupestre. Arte Rupestre en Colombia. Journal of the Grupo de Investigación de Arte Rupestre Indígena (GIPRI). Edited by GUILLERMO MUÑOZ C. The second issue contains these research papers:

Volume 2 (1998):

DUBELAAR, C. N.: Un estudio sobre los petroglifos de Sur América y las Antillas.

MARRINER M., H. A.: Petroglifos: una breve comparación de tres sitios.

TRUJILLO, J.: Aportes de la tradición oral en el estudio del arte rupestre del Altiplano Cundiboyacense Colombiano.

RODRÍGUEZ, C.: Los petroglifos del Municipio del Colegio: modelo sistemático de registro.

MARTÍNEZ C., D.: Historia de los procesos de transcripción de arte rupestre en Colombia.

ISAACS, J.: Estudio sobre las tribus indígenas del Magdalena.

Вестник САИПИ (SAPAR Bulletin). Journal of the Siberian Association of Prehistoric Art Researchers (SAPAR). Edited by Y. A. SHER. The first issue contains:

Volume 1 (1998):

LEONTJEV, N. V.: New stelas of the Okunevo Culture from the region of the Chernovaya River.

ZAIKA, A. L., I. N. EMELJANOV and A. P. BEREZOVSKI: New data on the rock art of the Lower Angara.

DEMESHCHENKO, S. A.: Concerning the interpretation of one of the art objects from Kostenki 1.

CHEREMISIN, D. V.: The investigation of rock art in the Southern Altay in 1998.

RUSAKOVA, I. D.: The battle compositions of the Abakano-Perevoz rock art site.

SOVETOVA, O. S. and E. A. MIKLASHEVICH: Investigation of the petroglyphs on the Kunya Mountain (Middle Yenisei).

KILUNOVSKAYA, M. E., E. A. MIKLASHEVICH, V. A. POPOV and V. A. SEMENOV: The petroglyphs on the Chyrgaky River (Western Tuva).

RECENT BOOKS OF INTEREST

The great civilisations of the ancient Sahara. Neolithisation and the earliest evidence of anthropomorphic religions, by FABRIZIO MORI. 1998. Translated from the Italian by B. D. Philips. 'L'erma di Bretschneider, Rome. Comprises 276 pages, 208 illustrations including many colour plates, glossary, bibliography, index. Hardback, ISBN 88-7062-971-6.

Fornminneforvaltning i praksis. Vern, bevaring og bruk av førreformatoriske kulturminner, by ANNE-SOPHIE HYGEN. 1999. Arkeologiske avhandlinger og rapporter fra Universitetet i Bergen, Volume 3, Bergen. Comprises 171 pages, 14 colour plates, line drawings, maps and tables, bibliography. Softcover, ISBN 82-90273-67-3.

Nale Tasih: Eine Floßfahrt in die Steinzeit, by ROBERT G. BEDNARIK and MARTIN KUCKENBURG. 1999. Jan Thorbecke Verlag, Stuttgart. Comprises 240 pages, 71 colour plates, numerous monochrome plates, line drawings, maps and diagrams, bibliography. Hardback, ISBN 3-7995-9029-3.

A visit to the White Lady of the Brandberg, by SHIRLEY-ANN PAGER. Typoprint, Windhoek. Comprises 23 well illustrated pages. Softcover, ISBN 99916-750-3-5.

RECENT PAPERS OF INTEREST

Peintures et gravures de Wazen (Ahaggar central), by JEAN-LOÏC LE QUELLEC and JEAN-LOUIS BERNEZAT. 1997. *Sahara*, Volume 9, pp. 120-123.

An engraved slate fragment from Walyunga, Western Australia, by ROBERT G. BEDNARIK. 1997. *Records of the Western Australian Museum*, Volume 18, Number 3, pp. 317-321.

Painted decorative motifs in the Ajanta Caves, by SHRIKANT A. PRADHAN. 1996/97. *Bulletin of the Deccan College Post-Graduate and Research Institute*, Volumes 56-57, pp. 129-134.

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As pinturas e as gravuras rupestres do noroeste do Pará Amazônia - Brasil, by EDITHE PEREIRA. 1997. *CLIO*, Volume 12, Number 1, pp. 87-98.

Tradição e ruptura na arte rupestre da Lapa do Gigante - Montalvânia/MG, by Loredana Marise and Ricardo Ribeiro. 1997. *CLIO*, Volume 12, Number 1, pp. 177-190.

In the footsteps of the ancestors: the Matsieng creation site in Botswana, by NICK WALKER. 1997. *South African Archaeological Bulletin*, Volume 52, Number 166, pp. 95-104.

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Changing perceptions in rock art conservation and management, by ROBERT G. BEDNARIK. 1997. *Pictogram*, Volume 9, Number 2, pp. 1-8.

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Art rupestre dans les tassilis du Nord (Sahara central), by FRANÇOIS SOLEILHAVOUP. 1997. *Sahara*, Volume 9, pp. 63-86.

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'Battered bulls': rock art destruction in Egypt, by DIRK HUYGE. 1998. *African Archaeological Review*, Volume 15, No. 1, pp. 3-11.

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Indications about the economic strategies as indicated from the rock art of the central Sahara: the 'Round Heads' phase, by UMBERTO SANSONI. 1998. In Savino di Lernia and Giorgio Manzi, *Before food production in north Africa. Questions and tools dealing with resource exploitation and population dynamics at 12,000-7000 bp*, pp. 147-162. U.I.S.P.P. 1996 Congress. Edizioni, Forlì.

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Interpreting the 'megalithic art' of western Iberia: some preliminary remarks, by VÍTOR OLIVEIRA JORGE. 1998. *Journal of Iberian Archaeology*, Volume 0, pp. 69-83.

Giraffes in ancient Egypt, by DIRK HUYGE. 1998. *Nekhen News*, Volume 10, Fall Number, pp. 9-10.

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ORIENTATION

Third AURA Congress

Millennium: a fresh start

The Third AURA Congress will be held in Alice Springs, central Australia, from Monday, 10 July to Friday, 14 July 2000. It will be preceded and followed by a major program of field trips covering much of the continent of Australia. The Congress is to include the Annual IFRAO Meeting, the Annual General Meeting of AURA and other events. The academic sessions are to include the following symposia.

Call for papers

Papers are invited now for the following symposia of the Third AURA Congress. Paper titles and abstracts can be submitted either to one of the Symposium Chairs listed below or to the Editor of *Rock Art Research*. Papers accepted for presentation will be published. **Please note that many further symposium rationales have appeared in *RAR* 16: 63-69.**

THE TECHNICAL EXAMINATION AND PRESERVATION OF PAINTED SITES

Chaired by Jacques Brunet, Cliff Ogleby and Andrew Thorn

The condition of painted rock surfaces varies enormously, not only from region to region but also within sites located metres apart. Scientific research into the causes of deterioration and methods of monitoring and stabilisation has been undertaken for some time but remains a science suffering from both lack of resources and, to some extent, suspicion. How can a spectrophotometer protect a sacred image? What role in maintaining a cultural connection does a thermohydrograph play?

In many instances the answer is 'Very little'. Too often science (unlike rock art research) is self serving and seldom used as a diagnostic tool from which sound protective decisions are made. Competing for the same tenuous foothold are the less elegant strides of generalisation and surmise that seem more digestible and plausible.

An example that encapsulates both the problem and the need for scientific responsibility is the old adage, 'It was much brighter last time I came'. How much brighter. How much brighter the observer.

At a recent conference one speaker called for the removal of acacias while the next advocated their introduction. Both were correct. They had both diagnosed the situation accurately and both were aware of the impact.

This session will present a series of papers outlining current approaches to the evaluation, monitoring and preservation of painted sites. Papers are invited from all practitioners in the field who describe how scientific research has guided their judgement in the protection of a site. Papers that challenge the role of science will also be most welcome. Abstracts and outlines of 100 to 150 words can be sent to:

Andrew Thorn
ARTCARE
2 McCabe Place
North Melbourne, Vic. 3051
Australia
E-mail: *artcare@.citicomp.com.au*
Fax No.: (61) (03) 9326 9327
RAR 16-505

RECORDING, STORING AND COMMUNICATING ROCK ART DATA

Chaired by Mila Simões de Abreu, Jane Kolber and Andrea Arcà

Rock art recording has expanded in many directions since the first initial attempts. From simple note taking and snapshots, methods and approaches have been experimented with from all possible fields of study and computerised technology. This session will bring together as many of these approaches as possible:

A - Data

A1. Data collection and management to cover records, archive management, databases, mapping, GPS, GIS etc.

A2. Photographic imagery, covering films, cameras, digitising, video, CD and DVD, digital enhancement.
A3. Reproduction of engraved and painted elements and surfaces by sketches, scale drawings, photo-drawing, bi-dimensional, three dimensional and high-tech tracings.

B - Communication
B1. Traditional print: books, booklets, reviews, newsletters etc.
B2. Museums, exhibitions, Parks.
B3. Digital and virtual: web sites, on-line reviews, on-line exhibitions, CD-ROM, multimedia, video etc.

C - Research and methods
C1. History and tradition including bibliographies, research, popular traditional inquiry, popular traditional recording.
C2. Methodology to cover research organisation, fieldwork planning, roles of volunteers, training programs, roles of academia, and interpretation.
C3. Funding to gain the means of attaining the above through grant-giving institutions, government agencies, private donors, academia and fundraising projects.

Please submit paper titles and abstracts (100-150 words) to:

Dr Mila Simões de Abreu
Seccão de Geologia - Unidade de Arqueologia
UTAD, Apartado 202
5001 Vila Real Codex
Portugal
E-mail: *msabreu@utad.pt*
Fax No.: +351 (59) 326 146
RAR 16-506

ROCK ART OF THE AMERICAS

Chaired by Mario Consens and Jack Steinbring

Abstracts to cover any aspect of rock art research in the Americas are invited. Preference will be given to those addressing problems of long standing (like the nature of initial rock art, or disputed timing) and for which new and compelling data have emerged. Specialised research on relationships between rock art and landscape, ecological factoring, the socio-cultural role, and critical cases of conservation needs will be especially welcome. Innovative theoretical pursuits are encouraged so long as the data used and the theoretical applications are most appropriate to the New World.

Please forward written abstracts of 150 words or less before 1 April 2000 to:

Professor Jack Steinbring
Fax No.: U.S.A. 920-748-7243; or e-mail:
SteinbringJ@ripon.edu

or Mario Consens
E-mail: *consens@adinet.com.uy*
RAR 16-507

ROCK ART IN AFRICA

Chaired by Jean-Loïc Le Quellec and Manuel Gutierrez

Recent and methodological research on rock art in Africa is welcomed in this Congress which should become an important place for the presentation and discussion of ideas concerning rock art.

Africa's rock art is both abundant and varied: from the Messak in the north to the Cape in the south, from the Horn of Africa to the Atlantic Ocean, are found thousands of sites bearing diverse forms of expression, including reliefs, engravings and paintings. Rich in thematic content, they correspond in different degrees to the socio-cultural conceptions of the diverse societies which people the continent. The time span of artistic creation is also extensive, flowering over several millennia. One finds painted plaques dated to 26 000 BP at the Apollo 11 site in Namibia as well as recent petroglyphs and paintings.

Research in African rock art, while only a little more than a century old, has produced several hundred studies. The extent of the research and the rigour employed vary; some studies represent the spirit of the times, while others reflect the author's prejudices, but recently, more methodological studies have been undertaken. There still remains, however, much ground to be covered in the study, the comprehension and the protection of African rock art sites.

In Africa, as in other regions of the world, writing has only been used during the most recent eras of human occupation. The study of rock art in a historical perspective is thus very important. In addition, the meaning and symbolism of certain figures and colours has been maintained up to very recent times, and indeed in some cases to the present. An ethnological approach, methodologically conducted, may thus be able to open a path to understanding paintings and petroglyphs and give us a better insight into the past.

In addition, research techniques that have been used to study rock art sites elsewhere should also he applied to African sties. Examples of these techniques include the analysis of pigments, but dating by AMS ^{14}C and archaeological, palaeo-environmental and linguistic data should also be integrated into the study of rock art.

Lastly, the fragility of the sites and of the depictions, the continued occupation of these spaces, leading in some cases to the destruction of the art, make these sites very vulnerable. It is necessary, also, to discuss measures of conservation which may he taken to preserve the sites, and in addition, to preserve the memories held by nearby peoples and societies that pertain to the meaning of these sites, as these neighbouring societies play an important role in the protection and in the understanding of this cultural heritage.

Papers covering any of these topics, presenting recent work, new perspectives in research or promising results will be most welcome. Please submit titles and abstracts (100-150 words) to:

Dr Jean-Loïc Le Ouellec
Brenessard
F - 85540 St Benoist-sur-Mer
France
Tel./fax No.: 00 33 (0)2 5197 4367
E-mail: *jilq@aol.com*

or Dr Manuel Gutierrez
Laboratoire de Recherches sur l'Afrique
Maison de l'Archéologie et l'Ethnologie
21, allée de l'Université
F - 92023 Nanterre Cedex
France
Tel./fax No.: 00 33 (0)1 4669 2627
E-mail: *guti@mae.u-paris10.fr*
RAR 16-508

CURRENT STUDENT RESEARCH: THE FUTURE OF ROCK ART STUDIES

Chaired by Reinaldo Morales, Jr. and Alanah Woody

In the past several decades rock art research has developed into a multi-disciplinary field of study. In addition to the ongoing work in the discipline of archaeology, advances in understanding rock art are resulting from work in the fields of cultural anthropology, chemistry, art history and philosophy, to name a few. This widening interest is evident in the growing number of professional conferences and academic journals either dedicated to or including the study of rock art.

The future of any discipline lies in its ability to reproduce its ethical and intellectual goals among its junior scholars. The nature of rock art research requires that these scholars negotiate multiple approaches, diverse methodologies and various theoretical paradigms in the pursuit of their education. Due to the relative paucity of rock art-oriented curricula the contemporary student is frequently involved in cutting edge research within their discipline. Encouraging a diversity of approaches to the study of rock art by exposing students to the current research under way by their peers is essential to the continuing growth of the field as a vital component in contemporary academia. The future of rock art research is now taking shape in the university.

The purpose of this session is to allow rising scholars the opportunity to introduce their work to an international audience and to stimulate a formal exchange of ideas among peers and professionals. At the 1999 International Rock Art Congress in Ripon, Wisconsin, a special meeting was arranged called 'Dinner with a Pro'. This was an informal exchange of ideas and goals between students involved in rock art research and professionals in the field. This session will provide a forum for a more direct exchange between scholars and students in the context of the current research being pursued in the world's universities.

Due to the calibre of research traditionally presented at these international congresses many students are possibly too intimidated to submit their own research for consideration. By providing a forum specifically for student research it is the hope of the organisers that this will encourage the participation of those who might be otherwise reluctant to do so.

This is not a topic-based session. Papers on any subject, from any geographic region and concerning any aspect of the study of rock art will be considered. Any student currently seeking an advanced degree involving rock art research at the time of the congress is invited to submit a presentation proposal.

Proposals should include the title of the paper, a 100-150 word abstract, author's full name and academic affiliation (institution, program/department, degree, and if applicable, major field adviser). Complete contact information is required for the author. A curriculum vitae is not mandatory but is preferred. E-mailed proposals will only be considered with an accompanying hard copy via standard mail. The deadline for submissions is 1 April 2000.

Please send proposals to:

Reinaldo Morales, Jr.
1006 Park Avenue #1
Richmond VA 23220-4735
U.S.A.
E-mail: *ditomorales@msn.com*

or Alanah Woody
E-mail: *woody@ecostar.minden.nv.us*

RAR 16-509

OPEN SESSION

Papers on any rock art topic not covered by the announced symposium subjects and rationales will be presented in an open session. Please send presentation titles and abstracts (100-150 words) to the Editor of *RAR*, P.O. Box 216, Caulfield South, Vic. 3162, Australia. Fax. No. 613-9523 0549; e-mail *auraweb@hotmail.com*

ROCK ART, EDUCATION AND ETHICS

Chaired by Dario Seglie (Italy, co-chair to be announced).

(This is a revised version of the call for papers in *RAR* 16: 65)

Rock art is an enormous accumulation of data on human spiritual activities, an early expression of consciousness, and it is part of the cultural heritage of mankind, accumulating progressively in the course of civilisation. From the end of World War II the discipline of rock art research and cognitive archaeology studies has begun to emerge and, particularly during the last quarter of the century, the interest in rock art has greatly increased all over the world. The number of scholars has similarly grown and, thanks to the mass media, the public has become attracted and charmed by the themes connected with the art and the origins of 'palaeoart'.

Unfortunately, the increased use of this prime source of knowledge has not been matched with a corresponding awareness of its intrinsic fragility. Rock art sites are often 'sacrificed' to a new cultural tourism, which submits them to stress and to an accelerated decay and destruction. Environmental pollution, acid rains, forest fires and the environmental macro-modifications brought by man to the natural landscape, and the building of roads, long-distance power lines, ski lifts and cable ways, dams and water basins, railways, tunnels etc. are further threats to rock art.

Therefore the problems of preservation, conservation and protection of the rock art heritage — paintings and petroglyphs on rock surfaces, situated outdoors or under shelter — is the most urgent to tackle and to solve today. Concurrently, we have the problem of the quality and the growth of the research, of site locating, recording, filing, publication and diffusion of all information on rock art. These problems require new methodological strategies, the education of new generations of researchers and a renewed ethical code.

The urgency of this world-wide project, which we may say will take several decades, requires the commitment of the institutions in terms of energies and finances. Public education on rock art is 'preventive conservation'; it may prevent the destruction by anthropic impact. Some specific issues are: exploitation and use, management of sites, teachers' training, technicians' training, publication and mass media.

With the scientific research problem, we have also the problem of preserving, exploiting and making good use of the rock art heritage, with a particular regard to the educational staff (guides and keepers) and to the professional updating of teachers; it is, moreover, necessary to introduce a specific curriculum in the schools' world.

Educational programs for rock art cultural managers, researchers and teachers: rock art does not always find its right place in the projects of eco-territorial museums; this involves as consequences the lack of professional figures, the lack of structures and instruments to survey, to classify, to protect, to preserve and to value rock art. This also derives from the fact

that we have not enough didactic structures set to these goals. Therefore we think it is legitimate to explore all the possibilities offered by the educational structures already existing.

Rock art education symposia have been held at the International Rock Art Congresses at Pinerolo, Italy (1995), Swakopmund, Namibia (1996), Cochabamba, Bolivia (1997), Vila Real, Portugal (1998) and Ripon, U.S.A. (1999). In particular, this symposium is aimed at teachers, scholars, journalists, researchers, students, and will offer the opportunity to compare methodology, experiences, programs and projects in the field of cultural heritage, and its links to teaching and education, so as to plot and define the role of schools in forming the conscience of young people; hopefully their sense of civic duty and their solid scientific background will make up the strongest factor in the protection, conservation and appreciation of the cultural heritage that rock art research discovers and consigns to future generations.

The environment in general, and rock art in particular, should be ethically considered as something we have borrowed from our children rather than inherited from our parents. All over the world, teachers and schools, associations, institutes, parks and museums can play a fundamental role in rock art education, in trying to win this challenge for man's progress.

Please, send me your ideas, opinions, abstracts (<150 words) and papers:

Professor Dario Seglie (Director of CeSMAP, IFRAO-UNESCO Liaison Officer)
Centro Studi e Museo d'Arte Preistorica,
Viale Giolitti 1, 10064 Pinerolo (TO) Italy
Tel. +39 0121794382 Fax +39 012175547
E-mail: *CeSMAP@cesmap.it*
Web page: *www.cesmap.it*
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Please note that many further symposium rationales have appeared in *RAR* 16: 63-69.

Congress field trips

To book, or to express interest in, any of the following congress field trips please contact the address provided with each announcement. These are the field trips taking in excess of four days. Field trips of 1-4 days will be announced in due course.

AURA PRE-CONGRESS TOUR

SYDNEY TO ALICE SPRINGS

Led by Caryll Sefton

Thursday, 22 June to Sunday, 9 July 2000 — 18 days

The tour is led by experienced rock art researcher Caryll Sefton and operated by Richard Jordan of Emu Tours. Richard has been operating Emu Tours for over ten years and is a specialist in nature tours with the focus on birds. Caryll and Richard led the successful Grand Tour of N.S.W. Rock Art Sites associated with the Second AURA Congress held in Cairns in 1992.

Preliminary program

The tour will visit rock art sites in south coastal N.S.W. near Wollongong and with a local Aboriginal guide at Jervis Bay. We will then head inland to sites in the southern highlands near Canberra and at Bigga. Further west we will visit Yuranigh's grave marked by carved trees at Molong on the western slopes.

Then in western N.S.W. we will visit the site complex at Mount Grenfell, Sturts Meadows, Eurieowie and Mootwingee. In South Australia at Yunta we will see the Panaramitee type site and other sites before proceeding to Flinders Ranges rock art sites. In the Northern Territory we'll see rock art at Uluru (Ayers Rock) before proceeding to Alice Springs.

The tour will also include a visit to Burra, a historic mining town, the beautiful Clare Valley, with its villages and wineries, and Coober Pedy, an opal mining town where we'll stay overnight in an underground hostel.

All transport, accommodation and meals are included — except two lunches when we will stop at road houses. The tour is fully accommodated except for five nights camping. All camping equipment is provided including sleeping bags and pillows.

Minimum number of participants 10, maximum number of participants 16.
Cost $A2730 per person.

For further information, itinerary and booking form contact Richard Jordan, Emu Tours, P.O. Box 4, Jamberoo, N.S.W. 2533, Australia. Tel. No. 0242 360 176, international +61 2 4236 0542, Fax No. 0242 360 176, international +61 2 4236 0176; e-mail: *emutours@ozemail.com.au*
Web: *http://www.ozemail.com.au/~emutours/*
RAR 16-511

AURA PRE-CONGRESS TOUR

KEEP RIVER AREA

Led by Ken Mulvaney

The majority of sites that are planned to be visited are in remote and isolated locations of the north-western part of the Northern Territory. Few, in fact, have defined access (roads or tracks) and most will require four-wheel drive travelling. Participants in this pre-congress field trip will be required to obtain their own transport. (Note: co-ordinating various participants in sharing hire vehicles could be facilitated. In addition, one or two vehicles may be available to take passengers; if so, conditions will be cramped).

It is intended to commence the field trip from the Western Australian town of Kununurra. Road and air access is available, either from Darwin or Perth. (Note: there is a limited number of 4WD vehicles in Kununurra, those intending to hire will have to get in quick). Specific gathering point at Kununurra and departure time on the site visits will be arranged once an indication of participant number is available. Nevertheless, it is intended that this field trip occurs in the

week prior to the Third AURA Congress.

Accommodation will be basic, camping either at one of the Aboriginal communities or at an isolated spot yet to be determined. Participants will need to supply their own sleeping gear, the weather is generally dry and mild, sleeping out with just a 'swag' will suffice. (Note: a limited number of swags may be provided). Catering will depend on numbers and participants' preferences, however, it is envisaged that evening meals cooked on open fires will be the mainstay.

Costs associated with this field trip are intended to be kept to a minimum. Payments to Aboriginal guides and food/drinks expenses are the expected incurred costs. All participants will be expected to contribute. Actual cost will be identified close to the date of the trip, depending on numbers of Aboriginal and field trip participants. Remember, there will be the added costs of vehicle hire and fuel, and the expense of getting to and from Kununurra.

Planned itinerary (provisional):
Day 1. Gather in Kununurra, ensure adequate provisions and safety of vehicles. Stock up on supplies if necessary, meet Aboriginal custodians of sites to be visited, travel to intended camping place (approx. 90 km).
Day 2. Visit the Jinmium and Goorurarmum archaeological and sacred site complexes. Features include the site of the excavation, discussion of ancient dates, cupules and other petroglyphs and recent paintings.
Day 3. Visit the Granilpi archaeological and sacred site complex. Several larger rock formations containing paintings, petroglyphs, cupules and grinding hollows. Of note are four figures incorporating bees wax in the design, and the easternmost examples of 'Bradshaw figures' so far recorded (see this issue of *RAR*, pp. 127-9).
Day 4. Visit the Karlinga and Wulurungu archaeological and sacred site complexes. Karlinga contains the most extensive production of painted images within a single rockshelter.
Day 5. Visit the Nganalang and Jinumun archaeological and sacred site complexes. The sites are within the Keep River National Park, a 150 km trip back through Kununurra.

Final itinerary, costs and other related details will depend on numbers of delegates wanting to participate in this field trip. Remember, because of logistics, the number of participants will be limited. Timing to suit commencement of Congress. Expressions of interest should be sent by mail to Ken Mulvaney, P.O. Box 1890, Darwin, Northern Territory 0801, Australia; or by e-mail to *ken.mulvaney@nt.gov.au*
RAR 16-512

AURA PRE- AND POST-CONGRESS TOURS
CENTRAL WESTERN AUSTRALIA
Led by Esmée Webb

This field trip offers a glimpse of an often ignored part of Australia and the contrast between inland and coastal landscapes and flora. It will focus on Walga Rock, 50 km west of Cue, a historic Goldrush town 650 km north-west of Perth. This painted site, in which the oldest implementiferous deposits have been dated to about 10 000 BP, contains nearly 1000 mostly non-figurative motifs, the largest body of art south of the Pilbara and west of the Central Desert.

This tour is expected to last about five nights, six days. It will head north from Perth, half a day will be spent at Walga Rock. Three sites recently recorded by the organiser near Cue will also be visited, including peckings, abraded grooves, cupules, stencils etc. The tour will then continue to Willi Gulli, about 50 km north of Geraldton, the largest body of paintings known in the coastal zone. It will return to Perth via the stone arrangements (geoglyphs) at Canna and the fluted finger markings in Orchestra Shell Cave, Wanneroo. Members of the local Aboriginal community will be present at most sites to talk about their links to the country. The proposed itinerary is:

Day 1. Perth - Paynes Find - Alfie Lawson's shelter - Mt. Magnet o/n
Day 2. The Granites - Yarraquin - Gidgee - Cue o/n
Day 3. Walga Rock - Gila - Cue o/n
Day 4. Red Bluff? - Yalgoo - Wurarga - Mullewa or Tallering station o/n
Day 5. Glacier bed - Willi Gulli - Geraldton o/n
Day 6. Geraldton Museum and cathedral - Canna - Wanneroo - Perth

Transport in buses seating 10-12 people, accommodation in small country hotels and all meals should cost $A150-200 per person per day. Each person may bring 10 kg of luggage in a soft bag, other luggage will be stored in Perth. Tag-alongs in own 4WD vehicles at own expense will be welcome. If there is sufficient interest this tour will be run both before and after the Congress, dates to be advised.

Apart from Geraldton, the towns we will pass through have stores but no banks. Participants should bring cash for incidental expenses, plenty of camera film, a water bottle, shady hat and 15+ sunblock, warm waterproof gear, walking boots, field and 'tidy' clothes. The day to day itinerary will be flexible.

For further information please contact: Dr Esmée Webb, Centre for Human Genetics, Edith Cowan University, Joondalup, W.A. 6027, Australia.
Tel. No.: +61 8 9271 9702 (H), Fax No.: +61 8 9400 5717 (W), e-mail: *e.webb@cowan.edu.au*
RAR 16-513

AURA PRE- AND POST-CONGRESS TOURS
KIMBERLEY REGION
Led by Helen Read, Didgeri Air Art Tours

The pre-congress tour leaves from Darwin on 29 June 2000. We will be guests of Peter and Pat Lacey on Mt Elizabeth Station and will be travelling via the Aboriginal art-producing communities of Yuendumu and Balgo Hills in the Tanami Desert. We arrive in Alice Springs on the 8 July 2000.

The post-congress tour departs Alice Springs on 17 July and finishes in Darwin on 26 July 2000, along the same route.

The tours are both for ten days and are a combination of aircraft charter and 4WD. The price for each tour is $A5750.00 and is all inclusive of 4WD and equipment to camp out, meals, aircraft charter, arrangements and logistics to tour and for visiting permits to the closed Aboriginal communities, plus accommodation.

The art community at Yuendumu is the Warlukurlangu Artists Association. Senior people from the community are willing to talk to us about their land and iconography in their traditional and contemporary art works.

At Balgo Hills Warlayirti Artists the new art centre is the pride of the community and is home to word-famous contemporary artists such as Eubena Nampitjin and Jumpo Tjapanangka. There is an unusual rock art site 8 km away at Ngamaloo on an escarpment overlooking the Tanami. We shall be visiting this site with a local escort.

In the Kimberley we will be travelling by 4WD with Peter Lacey for six days. We shall be driving down the rugged Bachsten Creek track toward Walcott Inlet. Rock art sites include Wandjina and 'Bradshaw' figures; human, spirit, animal and design motifs are found in multiple locations.

A more detailed itinerary, list of what to bring, and suggested reading list is available on request. A 50% deposit confirms the booking. There is a maximum of ten seats available on each of the pre- and post-congress tours. The minimum number is four or seven (as another aircraft will be used for numbers over five).

Please make cheques payable to Didgeri Air Art Tours and include your weight and any special requirements, such as dietary or medical. Anyone requiring special needs is welcome to call me to discuss management.

Helen Read
P.O. Box 108, Parap, Darwin, N.T. 0804, Australia
Tel./Fax No.: +61 8 8948 5055, mobile 0418 137 719
E-mail: *art.tours@didgeri.com.au*
Web site: *http://www.didgeri.com.au*
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AURA PRE- AND POST-CONGRESS TOURS

FOUR KUNUNURRA TOURS

Organised by Lee Scott-Virtue

Four tours of five days each are being organised by archaeologist Lee Virtue-Scott of Kununurra. All can be run before and/or after the Congress, depending on interest expressed.

KUN/5: five days looking at rock art sites in and around Kununurra. This tour would require participants to arrange accommodation in Kununurra, see below. The itinerary includes Mistake Creek rock art sites, Maxwell Plains rock art sites, Rosewood station sites, Spirit Hill station and Hidden Valley. Cost $A750.00 per person, excluding accommodation.

BB/5: five days looking at rock art sites in the Bungle Bungles, with four nights camping. The itinerary includes Mistake Creek sites, Aboriginal cultural centre in Wurman, and painting and petroglyph sites in the Bungle Bungles, e.g. Beehive rock art sites, Echidna gorge, Piccaninny. Cost $A890.00 per person.

ELQ/5: five days at El Questro looking at rock art, four nights camping. Rock art sites and complexes visited will include Mistake Creek, Emby Rock, Cockburn Range Maze, Moochalabra, Chamberlain Gorge, Emma Gorge and The Grotto. Cost $A850.00 per person.

KBEQ/5: three days in the Bungle Bungles and two days at El Questro. Sites to be included are Mistake Creek, Nitbudya sites, Beehives, Emby Rock, Chamberlain River (by boat), Cockburn Range sites. Last day strenuous, with optional helicopter flight as an extra cost. Cost $A950.00 per person.

Detailed itineraries are available on request. All quotes are based on a minimum of ten participants (one vehicle). Accommodation in Kununurra is not included, but the organisers can provide details of all options (a range from backpacker to 5-star is available) and arrange accommodation bookings. Accommodation at El Questro is also available as an option, at extra cost. The prices quoted include transport, field accommodation (all equipment provided, including mosquito domes and swags) and meals (alcoholic beverages are not covered), and all permits, fees and approvals by relevant authorities and Aboriginal custodians. The cost of Aboriginal tour guides is also included, in many cases local custodians will host site visits, and arrangements will include consultations of elderly and highly knowledgeable custodians at end of tour (some custodians will attend the Congress and present papers). Logistically only two tours can proceed at any given time.

Participants providing their own transport and camping accommodation are welcome to 'tag along' with any of these tours, with the exception of the Bungle Bungles component. Unfortunately we would not get permission to take more than the tour bus into any of the areas we propose to visit within the Bungles. The contribution of self-drive participants will be $A600.00 per vehicle. The occupants of each vehicle will be responsible for dividing this cost among themselves, and for organising their own camping equipment, food and any other expenses such as camping fee etc. at El Questro. The $A600.00 covers wages for the tour leaders and additional Aboriginal community access costs. There is no minimum number for these additional vehicles.

The tour organisers would like to set 1 March 2000 as the deadline for any interest in the various tours, and the end of April for booking. A 20% booking fee will be applicable. Final payment and confirmation will be one month prior to tour date.

Please send expressions of interest to the *RAR* Editor, P.O. Box 216, Caulfield South, Vic. 3162, Australia; or Fax No. +61 3 9523 0549; or e-mail *auraweb@hotmail.com*
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AURA POST-CONGRESS TOUR

KIMBERLEY FIELD TRIP

Led by David Welch

This tour takes the participants about 2000 km distant from Alice Springs to the northern tip of Western Australia. Temperatures vary enormously, with nights in central Australia being as low as 0°C, while those to the north along the coast may be warmer with minimums of 18°C. Maximum daytime temperatures are likely to be around 20°C in Alice Springs but around 30°C in the Kimberley. The condition of dirt roads in the Kimberley varies from good to bad, depending upon whether there has been a recent road grading. Generally, these will be heavily corrugated dirt roads with patches of sand, shallow river crossings and rough rock. A high four-wheel drive vehicle will be necessary for this tour.

We will have to limit ourselves to about 20 vehicles because the tracks and parking near some sites visited simply cannot accommodate more than this. It will be possible to visit between 50 to 100 individual sites or rockshelters, depending upon how much time people wish to spend at each site.

Some sites are at the base of cliffs and are reached by climbing rough, sloping screes. Sites on the Mitchell Plateau will require a 5-10 km bushwalk in 30°C heat and participants will need to have good footwear, broad hat, sunblock and carry water and their lunch. In other words, you will need to be fit!

All participants must be self reliant with reliable four-wheel drive vehicles. Hired vehicles are generally new. Common car problems which cannot be fixed easily in isolated places are: Battery mounts/supports not strong enough for rough roads. Check this. Also, replace battery before trip. Check/replace fan and other belts. Recondition the starter motor and alternator if these are more than four years old. Ideally, carry two spare tyres. Check radiator for leaks (get a pressure test done).

We will stay with the main highways for the first half of the trip. There are numerous 'road houses' (garages and stores)

for fuel, limited supplies and repairs along most of the route. We will mostly rely on roadside camping beside freshwater streams, but limited cabins and motel accommodation will be available close-by at some locations.

Planned itinerary: (This may change by mutual agreement amongst the participants) :
Saturday 15 July 2000. Prepare for trip. People who are hiring cars will need this time to organise their groups. Any spare time should be used to visit the petroglyph site at Ewaninga (near Alice Springs), if not already seen.
Day 1, Sunday 16 July.: leave Alice Springs and head north along the Stuart Highway towards Darwin. Stop at the Devils Marbles (scenic) and Tennant Creek. First night north of Three Ways.
Day 2, Monday: continue north. Swim at Mataranka Hot Springs. At Katherine, turn onto Victoria Highway. Camping and cabins at Victoria River Wayside Inn.
Day 3, Tuesday: visit rock art sites nearby (cupules, paintings etc.). Continue on toward Kununurra.
Day 4, Wednesday: visit art sites in the Kununurra area, including the Hidden Valley and Middle Creek site if accessible (paintings, thrown object imprints, grass prints, petroglyphs etc.). Visit art site at The Grotto (grass prints, paintings etc.).
Day 5, Thursday: on the Gibb River Road. Visit several art sites, one with fresh cupules.
Day 6, Friday: Mount Elizabeth Station. Visit art sites with traditional custodians.
Day 7, Saturday: travel back to Kalumburu Road and head north. Visit numerous sites on the King Edward River, including one painting dated at 24 000 years old. Camp beside fresh water. (Plenty of fish, best caught with a small lure.)
Day 8, Sunday: more sites on the King Edward River. Head north to Mitchell Plateau and set up camp beside fresh water.
Day 9, Monday: full-day bush walking, away from vehicles. Many spectacular art sites. Rough terrain. Some water on trail, but will need to carry two litres of water and lunch. Return to camp at night.
Day 10, Tuesday 25 July: second full day bush walking. Many good art sites. Magnificent scenery. Walk to bottom of Mitchell Falls. Steep, but safe descent. At this point, some participants may finish the tour and return to camp for the night, making their own way home from the Kimberley the next day. Others may wish to continue, visiting more art sites and exploring for several days, on foot and sleeping out, down the Mitchell River.

Expressions of interest to Dr David Welch, 1/5 Westralia Street, Stuart Park N.T. 0812, Australia,
Tel. No.: +61 8 89 83 2902 (home)
RAR 16-516

AURA POST-CONGRESS TOUR

TOP END OF THE NORTHERN TERRITORY

Arnhem Land, Kakadu and Katherine (Victoria River District)

Led by Mike Keighley

The Top End of the Northern Territory has some of the most extensive and diverse Aboriginal rock art in Australia. A unique feature of this art is its continuing connection and relevance to current Aboriginal culture. In places it forms the inspiration for contemporary works now produced on paper, canvas and fabric and is a link with living cultural tradition. Art, land and culture remains a dynamic and powerful combination which is the essence of Aboriginal presence and being in much of northern Australia.

This journey takes in some of the prime rock art sites in these regions, mostly out of the mainstream of visitation, linking into an understanding of their cultural and environmental background. Local guides and traditional custodians will provide the background insights in key locations and a specialist tour operator will co-ordinate the tour.

Tour outline: The tour will commence on Sunday, 16 July 2000 from Darwin - Katherine (Ingelari/Manyallaluk) - Kakadu - Arnhem Land (Oenpelli, Injalak Art and Craft Centre and Injalak Hill) - Mt Borrodaile (this is one of the most. significant art and cultural sites in Arnhem Land and will be the highlight of this tour) - back to Darwin on Tuesday, 25 July 2000.

Accommodation will he mixture of motel, safari camp and bush camping. Transport will include coaster bus, 4WD vehicles and air charter. The intent will be to minimise travelling time and maximise our stay in the key locations in each area.

Tour cost $A2990.00, twin share. This includes all accommodation, transport, guiding, camping equipment, park entry and permit fees. The price includes all meals whilst camping. Meals at motel accommodation are at participants' own expense.

This tour is an exclusive offering and numbers will be limited. To ensure your place please provide an expression of interest for more detailed information no later than 1 March 2000, by contacting:

Mike Keighley, Far Out Adventures
Tel. No.: +61 8 8972 2552, Fax No.: +61 8 8972228
E-mail: *mike@farout.com.au*
RAR 16-517

AURA POST-CONGRESS TOUR

ALICE SPRINGS TO BROOME

Uluru, Katherine, Kakadu, Victoria River District, Kimberley

Led by Richard Jordan

This tour is essentially a continuation of the Sydney to Alice Springs Tour, led by Caryll Sefton with Richard Jordan, see above. It commences on 15 July and ends on 3 August 2000. It is based on camping, with optional cabin or motel accommodation at some locations. The cost will be about $A120.00/day/person for a camping tour, based on between 10 and 16 passengers. This includes all transport, meals, camping fees, national parks entry fees and permits. All camping equipment is supplied, including sleeping bags and pillows, meals will be prepared by a cook. Transport is by 22-seat coaster bus with full air conditioning and trailer. The proposed itinerary is:

Day 1, Sat. 15 July: Alice Springs to Yulara - cultural centre and rock at sunset. Camping at Yulara camp ground, good facilities.
Day 2, Sun. 16 July: at Uluru - exploring rock art of Ayers Rock and Olgas. Camping at Yulara camp ground for second night.
Day 3, Mon. 17 July: northwards via Alice Springs to Barrow Creek. Overnight Barrow Creek camp ground (option of cabins).
Day 4, Tue. 18 July: on to the settlement of Larrimah in the Top End. Overnight caravan park - good facilities.
Day 5, Wed. 19 July: short drive to Katherine, and a cruise in

Katherine Gorge etc. Overnight camp ground at Edith Falls - great swimming hole!
Day 6, Thu. 20 July: on to Kakadu National Park via Pine Creek. Camp at Mardugal Camp ground near Cooinda or camping at Cooinda - with option of Cooinda motel at extra cost.
Days 7/8, Fri./Sat. 21/22 July: exploring the rock art sites of Kakadu. Two more nights camping at/near Cooinda, optional motel.
Day 9, Sun. 23 July: on to Victoria River via Katherine. Camping Victoria River caravan park, optional hotel/motel.
Days 10/11, Mon./Tue. 24/25 July: exploring the rock art of Victoria River District. Two more nights at Victoria River caravan park.
Days 12-14, Wed. 26 July to Fri. 28 July: on to Kununurra - exploring the rock art around Kununurra. Three nights at lakeside caravan park, optional motel.
Days 15-19, Sat. 29 July to Wed. 2 August: exploring the rock art along the Gibb River Road, Kimberley. Various camp sites.
Day 20, Thu. 3 August: conclusion of the tour in Broome.

For further information and booking form contact Richard Jordan, Emu Tours, P.O. Box 4, Jamberoo, N.S.W. 2533, Australia. Tel. No. 0242 360 176, international +61 2 4236 0542, Fax No. 0242 360 176, international +61 2 4236 0176; e-mail: *emutours@ozemail.com.au*
Web: *http://www.ozemail.com.au/~emutours/*
RAR 16-518

AURA POST-CONGRESS TOUR
PILBARA FIELD TRIP
Led by Robert G. Bednarik

This field trip is intended as an introduction to the largest petroglyph concentration in the world. It is planned to connect to the Kimberley Field Trip led by David Welch or Richard Jordan' tour (Alice Springs to Broome, see above). It is expected to commence at Port Hedland on or about the 5 August 2000 and will cover several dozen of the more accessible sites of the Pilbara, as well as sites further south, ending in Perth about two to three weeks later. Participants of this field trip will provide their own transport and supplies, accommodation will be mostly by camping, either in the open or at caravan parks, with the occasional option to stay at a motel overnight. Roads are mostly in good condition, 4WD vehicles are recommended but not absolutely essential. The itinerary is intended to include numerous rock art sites, mostly of petroglyphs, on the upper Yule, in the Chichester and Hamersley Ranges, Hillside area, near Port Hedland and Dampier. Costs (other than living and transport expenses) will be limited to fees for Aboriginal site custodians and permit fees where applicable.

Please send expressions of interest to the *RAR* Editor, P.O. Box 216, Caulfield South, Vic. 3162, Australia; or Fax No. +61 3 9523 0549; or e-mail *auraweb@hotmail.com*
RAR 16-519

AURA POST-CONGRESS TOUR
QUINKAN SAFARI
Led by Steve Trezise

This safari is for delegates to experience some of the best of the Quinkan rock art in the Laura district of Cape York Peninsula, northern Queensland.

The safari departs Cairns on Monday, 17 July 2000 and is led by Steve Trezise. Participants can join for three or five days, having flown from Alice Springs to Cairns on 15 or 16 July.
3 Days, $A595: Jowalbinna and Laura sites.
5 Days, $A795: Jowalbinna, Laura and Deighton River sites.
Prices are inclusive of all transport, accommodation, meals and guide service.
Self-drive visitors (4WD essential) are also welcome to visit Jowalbinna and Deighton River camps.

For inquiries and bookings please contact:

Steve Trezise, P.O. Box 106 , Freshwater, Cairns Qld 4870, Australia
Tel. No. +61 7 40 370 605
RAR 16-520

THE 2000 AURA GRAND TOUR

The Grand Tour of the Third AURA Congress begins in Sydney on 22 June 2000 with the Sydney to Alice Springs Tour led by Caryll Sefton, reaching Alice Springs in time for congress registration. After the congress, it offers two options, either the Alice Springs to Broome Tour led by Richard Jordan, or the Kimberley Field Trip led by David Welch. The first ends in Broome on 3 August, the second ends in the Kimberley on 25 July or a few days later (knowing David he is likely to discover new sites!). In either case, participants continuing on will make their way to Port Hedland (there is no rock art between Broome and Hedland) where the Pilbara Field Trip, led by Robert G. Bednarik, commences on 5 August. This will bring them to Geraldton a couple of weeks later, where it may be arranged to visit the sites in central Western Australia listed by Esmée Webb above. Thus the Grand Tour will end in Perth in late August, more than two months after it began, and after covering more than 12 000 km. It will include all major rock art regions of Australia with the exception of those of Queensland (which were covered very well in 1992, after the Second AURA Congress).

Prospective participants undaunted by the logistics of this tour would need to contact Richard Jordan (and possibly David Welch) and Robert Bednarik, see above details.
RAR 16-521

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Further field trips are in preparation, please consult future announcements in *AURA Newsletter*, *RAR* and other rock art journals. The tours listed here are merely the field trips taking in excess of four days. There will also be a number of field trips of 1-4 days in the general region of central Australia. For further congress details please see IFRAO Report No. 23 on next pages.

Moroccan Association for the Protection of the Rupestrian Heritage

The Association Marocaine pour la Protection du Patrimoine Rupestre has been established in Morocco. The country has a rock art heritage of exceptional richness, which represents a fundamental element for understanding of Moroccan history and culture. In addition to natural deterioration it now suffers from unprecedented anthropic degradation. It is the aim of the new organisation to protect this heritage and to highlight its importance. The Association's mission is to:

- protect and preserve the rock art heritage in its natural context;
- reinforce the legislative framework concerning the protection of Moroccan rock art sites;
- contribute to the integration of the rock art heritage into the national socio-economic fabric;
- establish partnership relations with public institutions and national and international organisations of similar vocation;
- work towards highlighting the importance of the rupestrian heritage through raising awareness of its importance and by publishing.

The Association cordially invites members of AURA to come and meet their members if they are visiting Morocco. The committee members of the Association are: Mohssine El Graoui (President), M'hamed Sallou (Vice-President), El Mustapha Nami (Secretary General), Naïma Oulmaki (Vice-Secretary General), Abdelkhalek Lemjidi (Treasurer), Aïcha Oujaa (Vice Treasurer), Mohammed M'hamedi (Relations Officer), Abdrrahim Badrane (Communications Officer) and Susan Searight (International Relations Officer).

Association Marocaine pour la Protection du Patrimoine Rupestre
Riad Attakafa
Dar El Glaoui
R'mila 42 000
Marrakech
Morocco
E-mail: *amppr@caramail.com*
Fax No.: (212 4) 44 35 85
RAR 16-522

5th International Rock Art Symposium, Bolivia, September 2000

The Bolivian Rock Art Research Society SIARB is organising its Fifth International Rock Art Symposium which will take place in the city of Tarija on September 18-24, 2000.

SIARB already organised four similar events which were carried out successfully in 1988, 1989, 1991 and 1997. The Fifth International Rock Art Symposium will deal with the following:

- Session 1: Recording of rock art sites, discussed in a forum among rock art specialists coming from several continents, exemplified in a workshop which will record rock paintings and petroglyphs at a site near Tarija. Chairpersons: Jane Kolber, ARARA and Rock Art Recording School of the Archaeological Society of Arizona, and Freddy Taboada, SIARB.
- Session 2: Rock art along the Bolivian-Argentinian frontier (south Tarija, Potosi and Chuquisaca, Bolivia, and north-west Argentina). Chairpersons: Alicia Fernandez Distel, Museo Arqueológico Provincial. Jujuy, Argentina, and Carlos Methfessel, SIARB.

Rationale of Session 1 (by Jane Kolber)

This conference aims to discuss appropriate documentation (or recording) of rock paintings and engravings (petroglyphs), including traditional methods as well as modern technology. The utmost importance of a reliable and comprehensive recording of rock art sites is obvious: it is the basis of all conservation, preservation and research of rock art. Without it no valid or productive accomplishments can be achieved. Processes began with simple sketches and photographs and have progressed to high technological methodology. Each rock art site and project requires specific processes to meet its needs. The size, location, construction, whether painted or engraved, cultural and archaeological setting, accessibility, ownership and management, unique requirements and circumstances of specific regions or countries all effect the processes chosen. Time, funds, skills and interests or the recording group also contribute to the limitations of the work. The specific purpose, whether for conservation, site management, research assignment etc., must be considered in planning the project. Determining the processes to utilise should be based on these and other considerations. For these reasons a recorder, conservator, researcher must know as many approaches and techniques as possible, where they may either learn to produce them or obtain the services of those who can. To this end, this symposium is being held to enable the sharing of knowledge and experience in all areas of rock art documentation encouraging a broad spectrum of ideas and methodology. Our goal is to gain a deeper understanding and more skills, with the purpose of encouraging and facilitating the addition of more documented sites, and thereby more protected and researched rock art sites.

In previous meetings of rock art specialists in Latin America (including the four international symposia organised by SIARB between 1988 and 1997) there have never been sections dedicated entirely to the subject of rock art recording. While some investigators in Argentina, Brazil, Bolivia and other Latin American countries carry out rock art research in a scientific way, in many cases rock art recording is unsatisfactory: it is not part of a comprehensive plan of investigation and/or management of sites, remains incomplete, and sometimes even

uses intrusive methods, such as chalking out of petroglyphs, which distort the existing rock art or endanger its conservation (such as wetting rock paintings). Over the past twelve years, SIARB has tried to promote non-intrusive scientific rock art recording. Its Fifth International Rock Art Symposium will be an important step in this direction.

Section 1 of the conference will provide papers by international investigators on different approaches and methods used in the documentation of rock art which will be discussed among participants (presentations may be in Spanish, Portuguese or English; a Spanish abstract will be provided in any case in a handbook including the program etc.). Recorders with different opinions, processes and purposes will make an oral presentation of a maximum of 20 minutes. Each presentation will be followed by a discussion period (up to 10 minutes). A final discussion evaluating overall aspects of all given papers will take place at the end of the session and should result in some guidelines for rock art recording. There is also the possibility to present a poster on rock art recording instead of a paper.

The Workshop will provide a rare opportunity to evaluate an existing partial recording of a complex rock art site and try out and discuss alternative methods.

Some 100-150 investigators will participate in this event, mainly from Bolivia and Argentina, with a few participants from other countries, such as Colombia, Brazil, Chile, U.S.A., Italy and Germany. Due to the characteristics of the Workshop, only 20 people will participate in this 'recording school', who must all have previous experience in rock art documentations.

The conference will take one week, divided into the following parts: 1st to 2nd day: Section 1 (recording of rock art). 3rd day: Section 2 (rock art along the Bolivian/Argentinian frontier). 4th to 7th day: Workshop. Sections will start at 8.30 in the morning, with a coffee break and lunch break and go on till the late afternoon. In the evening, there will be special presentations, such as the inauguration of an exhibition on rock art of Tarija and the presentation of videos. The Workshop will take place mainly in the field, at the rock art site La Aguada, situated 12 km from the city of Tarija.

There will also be a program of excursions to archaeological sites and rock art of Tarija in the days preceding the symposium.

Papers

The registration of papers should be carried out by sending a summary with a maximum of 150 words to the organisers by 30 April 2000. During the Symposium the complete text (print-out and diskette) must be submitted to the symposium chairpersons. Papers are planned to be published in a volume of the symposium proceedings.

There is a registration fee of US$50.00 which must be paid in advance by cheque made out to Matthias Strecker, Secretary of SIARB. Deadline for registration is 30 April 2000. For further information, contact:

Matthias Strecker, SIARB, Casilla 3091, La Paz, Bolivia (Tel./Fax No.: 591 2 711809, e-mail: *laranibar@mail.megalink.com*).

Regarding tourism and hotels, contact: Carlos Methfessel, SIARB, Casilla 139, Tarija, Bolivia (Tel./Fax No.: 591 66 30826, e-mail: *methfess@olivo.tja.entelnet.bo*)

Flights with LAB: Lloyd Aéreo Boliviano (LAB) is offering participants of this Symposium a 20% discount on their fares, for flights from abroad as well as for domestic flights to Tarija. Participants who wish to use this promotion must contact LAB's regional office (in the U.S.A.: 225 S.E. First St., Miami, FL 33131, Tel. [800] 327 7407) and provide proof of their symposium registration.

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Forthcoming events

Transformations. Mandurah, Western Australia, 9-11 December 1999. Australian Archaeological Association Annual Conference 1999. Enquiries to AAA Conference 99, c/o Centre for Archaeology, University of Western Australia, Nedlands W.A. 6907. Fax: (08) 9380 1023.

New Approaches to the Archaeology of Art, Religion and Folklore. Southampton, 11-12 December 1999. For details contact Robert Wallis, Dept of Archaeology, University of Southampton, Highfield, Southampton SO17 1BJ; e-mail: *rjw2@soton.ac.uk*

Second Worldwide Conference, Society for East Asian Archaeology. Durham, England, U.K., 6-9 July 2000. Proposals for panels and papers should be sent to: Gideon Shelach, Department of East Asian Studies, The Hebrew University, Mt Scopus, Jerusalem 91905, Israel. Fax: 972 2 5322545, e-mail: *msshe@mscc.huji.ac.il*

Building Bridges with Traditional Knowledge II. Honolulu, 28 May - 3 June 2000. An exploration of the issues involving indigenous peoples, conservation, development and ethnosciences for the new millennium. Details from Building Bridges Conference, University of Hawaii, Honolulu, HI 96822-2279, U.S.A.; e-mail: *bbt2@hawaii.edu*

AURA 2000: the Third AURA Congress. Comprises the IRAC 2000 and the 2000 IFRAO Meeting. Alice Springs, Australia, 10-14 July 2000. See announcements in *RAR* and elsewhere.

German Rock Art Congress. Frankfurt am Main, 8-10 September 2000. To be held by the recently established Deutsche Gesellschaft für Petroikonologie e.V. (German Society for Petroiconology). For details contact Thomas W. Wyrwoll, Fax No.: 0049 69 955000210; e-mail: *Thomas.Wyrwoll@gmx.de*

IFRAO Report No. 23

Proceedings of the 1995 International Rock Art Congress, Turin

The Centro Studi e Museo d'Arte Preistorica in Pinerolo, Italy, is proud to announce the publication of the NEWS95 Proceedings. The International Rock Art and Cognitive Archaeology Congress NEWS95, held under the aegis of IFRAO (the International Federation of Rock Art Organisations), and organised by CeSMAP, took place for the first time in Europe in Turin, at the prestigious Valentino Royal Castle, and Pinerolo from 30 August to 6 September 1995.

It has been one of the most important congresses at an international level, with more than 500 renowned scholars in archaeology and rock art from all over the world. We now present the proceedings of this event to the international scientific community. They are not simply a record of the scientific event; they have also benefited from revisions made by the authors since the Congress, and they are the result of the dedicated work of the chairpersons of different Symposia, with a combination of scientific rigour and collaboration.

They are presented in a mixed format, with a volume with the abstracts of more than 170 papers debated during the 16 Symposia of the Congress (136 pages) and a CD-ROM containing all the reports presented with thousands of illustrations (it corresponds to more than 15 volumes of 2000 text pages). The current trend for electronic scientific publishing was taken in consideration, permitting a fast, inexpensive and simple exchange of information and images through data transmission between institutions and researchers. The aim of these proceedings is to take part in the progress brought about by the computer revolution, and the diffusion of similar initiatives so as to consolidate relations of exchange between researchers, scholars and the public.

The official price of the *NEWS95 Proceedings* (abstracts volume and CD-ROM) is US$89.00 (overseas postage costs included), payable by bank transfer or by cheque; for booking or further information please contact:

CeSMAP, Study Centre and Prehistoric Art Museum, Viale Giolitti 1, 10064 Pinerolo, Italy, Tel. No. +39 0121794382, Fax No. +39 012175547, e-mail: *CeSMAP@cesmap.it*
Prof. Dr Dario Seglie, Director of Museum of Prehistoric Art; Dr Piero Ricchiardi, President, CeSMAP

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Special publication offer for the readers of *Rock Art Research* (see order form on page 108, this issue):
NEWS95 PROCEEDINGS
World Rock Art Congress, Valentino Royal Castle, Turin and Pinerolo, Italy,
31 August - 6 September 1995
Comprising one volume of abstracts, monochrome and colour; and one CD-ROM with 172 scientific papers of 2000 paper pages, 1200 illustrations, colour pictures, maps, bibliographies, photo gallery, consisting of:

SYMPOSIUM 1A: NEW APPROACHES
R. G. Bednarik, F. d'Errico
SYMPOSIUM 2A: SEMIOTICS, SIGNS AND SYMBOLS
P. Bouissac, M. Khan
SYMPOSIUM 3A: ROCK ART AND MUSICARCHAEOLOGY
E. Hickmann
SYMPOSIUM 4B: ROCK ART AND MASS-MEDIA
G. Boscolo
SYMPOSIUM 5B: MUSEOLOGY AND MUSEOGRAPHY
S. Santiano, M. Tonon, Y. Mathpal
SYMPOSIUM 7C: ETHICS
F. Soleilhavoup, D. Arsenault
SYMPOSIUM 8C: ROCK ART CONSERVATION AND SITE MANAGEMENT
A. Watchman, L. Godwin
SYMPOSIUM 9C: ROCK ART AND ARCHAEOLOGICAL EXCAVATIONS
M. Rossi, F. Fedele, V. O. Jorge
SYMPOSIUM 10C: RECORDING, DATING AND COMPUTER SCIENCE
B. K. Swartz, Jr., M. Simões de Abreu
SYMPOSIUM 11D: ROCK ART OF THE CIRCUMPOLAR COUNTRIES
K. Sognnes, A. Faradjev
SYMPOSIUM 12D: ROCK ART AND THE MEDITERRANEAN SEA
A. Beltrán, J. Clottes
SYMPOSIUM 13D: ROCK ART AND THE SAHARA
A. Muzzolini, J. L. Le Quellec
SYMPOSIUM 14D: NEWS OF THE WORLD
P. Bahn, A. Fossati
SYMPOSIUM 15-16D: ROCK ART, ETHNOGRAPHY AND CHRISTIAN MANIFESTATION
E. Comba, A. Guaraldo, A. Fernandez Distel

PRICE: US$89.00; special price for members of IFRAO-affiliated rock art organisations **US$55.00**.

IRAC '99: A few words from the organiser

Jack Steinbring

The Ripon Congress was not a flashy spectacle. It was just everything ever wanted in a high grade, international rock art event. The emphasis was immediately apparent. The Congress was truly international. No less than 37 nations were represented! This eclipsed all previous events of its kind, and will be hard to match for years to come. It took a profound effort by both MAGF and ARARA to aid the many travellers from distant lands. While ARARA focused mainly on established scholars, especially in Siberian rock art, MAGF worked to aid and encourage 'Third World' participants, including many from Hispanic nations, especially Central and South America. Included in these nations were Uruguay, Chile, Argentina, Peru, Colombia, San Salvador, Guatemala, Cuba and Mexico. Europe also was well represented with delegates from England, Ireland, France, Belgium, Spain, Portugal, Italy, Switzerland, Germany, Greece, Macedonia and Finland. Karen Niskanen of Finland became the first IRAC delegate from that country, and presented her work in Finnish rock paintings. They are virtually indistinguishable from many of those in the Canadian Shield.

There were also representatives from Australia, India, Japan, South Africa, Morocco, and many other countries. Besides this truly wide spectrum of the globe, over thirty states of the United States showed up. This may also be an unprecedented North American representation, owing in part to the outstanding participation of the Eastern States Rock Art Research Association. Dr Carol Diaz-Granados, president of that group, has already expressed her views on the Congress in the *ESRARA Newsletter*.

Dr Larry Loendorf, President of the American Rock Art Research Association, has also reported on the Congress, correctly calling attention to its strengths and some weaknesses. Among the weaknesses was a profoundly inappropriate and poorly presented 'banquet speech' by Dr Paul Bahn. Few probably know this better than Bahn himself, who has apologised. A highlight of the banquet was a distinguished service award by ESRARA to Dr James Swauger for his lifetime of recording and research in eastern U.S. rock art.

The main body of the Congress was a full week of formal presentations, running from 8:00 a.m. to 5:00 p.m. This amounted to some 23 sessions, essentially covering every phase of rock art research. The sessions were chaired by leading figures in the specialties. ARARA is presently assembling at least 50 of the over 200 papers for publication in a professionally managed volume on the Congress. Not only will this reflect the breadth of the event, but it will also constitute a timely and highly authoritative reference work on rock art in general. ARARA is to be congratulated for this ambitious effort!

The Congress was concluded with many excellent field trips and the formal meeting of IFRAO. The latter event went very smoothly, with quite a number of unanimously supported changes, all basically aimed at more thoroughly democratising the institution and increasing its efficiency.

There were many special events, the main one perhaps being four evening presentations, by prominent researchers, for the general public. These included Dr Jean Clottes' most recent (two weeks before the Congress!) discoveries, and the latest details on Dr Robert Salzer's investigations at Wisconsin's own famous rock art site — the Gottschall Rock Shelter. Further presentations by Dr David Whitley on rock art theory, and Dr Carol Diaz-Granados on the nature of archaeoastronomy in rock art, rounded out the week. These were presented to a full house each evening, accounting for well over 1000 attendants, many from Ripon and nearby communities.

An international stamp exhibition (depicting stamps with rock art on them) formed the central attraction in the foyer of Rodman Center where most of the academic sessions took place. It was organised and set up by Dr William Breen Murray from the University of Monterrey in Mexico. Matthias Strecker from Bolivia, one of the original organisers of the exhibition, was unable to attend but forwarded an excellent contribution of stamps depicting rock art from his country. This was undoubtedly the largest international exhibition of these specialised stamps, and also the first for IRAC. The Fond du Lac Stamp Club aided the exhibition greatly by arranging the provision of specialised, secure frames for the event. In association with the exhibition, the U.S. Postal Service provided a special stamp cancellation during one day at the Congress. The cancellation was applied to delegate mailings by the Ripon Post Office, and was very well attended.

An exciting and educationally valuable art event was initiated at the commencement of the Congress in the form of an aboriginal-inspired sculpture event. Jody Harrell of MAGF and Janet Lever of ARARA chaired and supervised students in preparing the sculptures, which were exhibited at the entrance to Storzer Gymnasium where the plenary sessions were held in the afternoons. This event has received wide acclaim.

An extensive array of posters was mounted on the walls of Rodman Center, among them the beautiful IRAC '99 poster designed by Charles Bailey, Jr. of Minnesota. Other big helpers from Minnesota were Deborah Morse-Kahn, Charles Bailey, Sr. and Kevin Callahan.

One other special event of note was an atl-atl demonstration arranged by Len Riemersma and sponsored by the National Atl-Atl Association. It attracted over 200 participants, and many congratulatory statements have been received. At the same time, a flint knapping demonstration was conducted nearby. This also drew much attention.

It would be impossible to identify all those who made IRAC '99 such a success. The international flavour of the event owes largely to the efforts of MAGF and ARARA in aiding those who could not possibly have attended without help. Exceptionally generous contributions by MAGF members were made 'just in the nick of time', and the profound gratitude of travellers is directed straight to them. More great help came from voluntary translators, led by Lucy Dowling for Hispanics, as well as Dr William Breen Murray (Mexico) and Mario Consens (Uruguay). Administratively, the inordinate efforts by Donna Gillette, ARARA, and her committee were indispensable. John Campbell stepped in at a crucial moment and took on a huge mailing. Franklin Farvour was my right hand associate in actually setting up the entire program. It took some three months, and Frank worked with me everyday, as a volunteer. Shining lights in media help were (as always) Dan McCarthy and Elaine Moore. Lisa Stone of the Ripon College Conference staff also played vital roles, especially in managing the room arrangements of hundreds of delegates. Transportation required an immense undertaking.

Delegates unfamiliar with the continental interior at times thought Chicago was only 20 miles from Ripon! Problems like this required a quick response by many volunteer drivers who collectively drove thousands of miles to assure that every delegate reached his or her destination. These many generous people also handled odd travelling times, and without them the situation would have been a shambles.

In the numerous congratulatory messages from the U.S.A. and abroad, one thing stands out beyond all others, and this was the beautiful environment of Ripon College, along with the excellent and convenient services. Along with this, all point to the friendly, engaging people of an essentially rural setting. People made this event, and the grassroots nature of MAGF achieved acclaim from around the world!

RAR 16-524

Third AURA Congress

Hosted by the Australian Rock Art Research Association in Alice Springs, 10 - 14 July 2000

The following symposia have been proposed:

ROCK ART AND COLONIALISM: SOUTH AFRICA, AUSTRALIA AND BEYOND. Chaired by Sven Ouzman (South Africa) and Claire Smith (Australia)

CONSTRUCTED LANDSCAPES: ROCK ART, PLACE AND IDENTITY. Chaired by Bruno David and Meredith Wilson (Australia)

ROCK ART, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT PLANS: REGIONAL PROJECTS. Chaired by Dario Seglie (Italy)

ROCK ART EDUCATION AND ETHICS. Chaired by Dario Seglie (Italy)

ROCK ART MANAGEMENT AND EDUCATION PROGRAMS FOR SITE VISITORS. Chaired by Natalie Franklin (Australia) and Elena Miklashevich (Russia)

ROCK ART AND RECONCILIATION. Chaired by Noelene Cole and John Campbell (Australia)

AESTHETICS OF ROCK ART. Chaired by Thomas Heyd (Canada) and John Clegg Australia)

ROCK ART AND INDIGENOUS ASTRONOMIES. Chaired by Philip Clarke and Hugh Cairns (Australia)

CENTRAL AND NORTHERN AUSTRALIAN ROCK-MARKINGS: ARCHAEOLOGICAL, ANTHROPOLOGICAL AND INDIGENOUS AUSTRALIAN PERSPECTIVES. Chaired by Graeme Ward (Australia).

SETTING THE SCENE: THE ALICE SPRINGS AND REGIONAL CONTEXT. Chaired by G. Ward and C. San Roque (Australia)

INDIGENOUS PERCEPTIONS BY THE USERS AND MAKERS OF ROCK ART. Chaired by F. Prins (South Africa) and J. Drew (Australia)

ROCK ART AND ECOLOGICAL KNOWLEDGE. Chaired by Paul Faulstich (U.S.A.), Paul Taçon (Australia) and David Bennett (Australia)

DATING ROCK ART. Chaired by Alan Watchman (Australia), Marian Hyman (U.S.A.) and Marvin Rowe (U.S.A.)

EPISTEMOLOGY AND ROCK ART RESEARCH. Chaired by R. G. Bednarik (Australia) and K. K. Chakravarty (India)

NEWS OF THE WORLD II - IRAC 2000. Chaired by Angelo Fossati (Italy) and Paul Bahn (U.K.)

THE TECHNICAL EXAMINATION AND PRESERVATION OF PAINTED SITES. Chaired by Jacques Brunet (France), Cliff Ogleby (Australia) and Andrew Thorn (Australia)

RECORDING, STORING AND COMMUNICATING ROCK ART DATA. Chaired by Mila Simões de Abreu (Portugal), Jane Kolber (U.S.A.) and Andrea Arcà (Italy)

ROCK ART OF THE AMERICAS. Chaired by Mario Consens (Uruguay) and Jack Steinbring (U.S.A.)

ROCK ART IN AFRICA. Chaired by Jean-Loïc Le Quellec and Manuel Gutierrez (France)

CURRENT STUDENT RESEARCH: THE FUTURE OF ROCK ART STUDIES. Chaired by Reinaldo Morales, Jr. and Alanah Woody (U.S.A.)

OPEN SESSION. Presentation of rock art-related subjects not covered above.

For details of paper submission please refer to the section *Orientation* in this issue of *RAR*, and to the May 1999 issue of *RAR*. All papers to be a maximum of 20 minutes presentation time, followed by 10 minutes of question time/debate.

FIELD TRIPS

The program of major field trips (5 days or more) involves about fifteen offers which range from guided self-drive tours to fully catered safaris by light aircraft. In all, these tours extend over a maximum period of more than two months and cover most of Australia's major rock art regions. Adequate details to assist participants in planning are provided on pages 138-142 of this issue of *RAR*.

Minor field trips (1-4 days) range from day trips to rock art sites near Alice Springs to longer tours of 2, 3 or 4 days (Uluru, Cave Hill, Wardaman rock art). Some will be self-drive tours, others will be guided. The latter will include tours by commercial Aboriginal tour operators, and tours using buses provided by AURA. For congress delegates who cannot stay longer than the actual congress week there will be opportunities to visit rock art sites close to Alice Springs during the congress week. Details of the minor field trips program will be announced in due course, costs of non-commercial tours will be limited to a minimum (bus fare, access fees and accommodation where applicable).

EVENTS

A sacred sand painting ceremony staged by Aboriginal custodians, organised by Peter Yates, will be conducted during the first two days of the Congress. An Aboriginal dance performance will also be presented to the congress delegates. Desart will assemble a major exhibition of Aboriginal art at the congress venue, including the work of world-famous artists. An official reception of the IFRAO Representatives will be given by His Worship the Mayor of Alice Springs.

Congress delegates are invited to contribute to a poster exhibition at the venue, and to bring their film or video material along for public viewing. The Congress will include the traditional rock art book and journal exhibition and exhibits are welcomed. Public evening lectures will be presented both at the congress venue (the Araluen Centre) and at other venues in Alice Springs.

REGISTRATION

Registration fees for the Third AURA Congress are:

Prior to 31 March 2000: Professional members $A190, other AURA members $A130, student and concession members $A60, non-members $A250 (US$125, 86, 40 and 165 respectively).

After March 2000: Professional members $A220, other AURA members $A160, student and concession members $A90, non-members $A280 (US$145, 106, 60 and 185).

This covers all events and facilities during the academic program week, including refreshments during morning and afternoon tea breaks. Excellent lunch service provided by caterers will be available at about $A10.00 per day to those wishing to have lunch at the venue. Registration fees also cover the right to participate in any of the field trips organised by AURA or guided by AURA volunteers.

FURTHER INFORMATION

The Araluen Centre is a superb modern convention complex. Its main theatre, the interior of which is illustrated in the congress flyer, seats 500, and the Congress, having booked the entire establishment, has the use of several more lecture, workshop and exhibition halls. The Centre is set in parkland next to a rock outcrop which is a sacred women's site (access not permitted to males). Among its features is an open-air 'amphitheatre', and a very large car park is a definite asset of the complex.

Alice Springs is one of the most isolated cities in the world, set in a stunning semi-arid landscape dominated by the Macdonnell Ranges. The town, which is very well served by restaurants and shops, including large department stores, exists primarily for tourism and July falls into its peak season. It is therefore strongly recommended to book accommodation early. I have checked out all of the hotels and accommodation venues listed on the registration form, most rates offered are substantially reduced as a result of my negotiations with all venue operators. Participants are advised that one of the hotels listed, which we have reserved entirely for congress delegates, will be booked out soon. To avoid disappointment it is advisable to book accommodation early.

The climate of Alice Springs in July is pleasant and not too warm, dry and consistently sunny. Temperatures reach around 20°C during the day, but nights can be very cool, when temperatures may fall to 0°C (freezing point) on occasion.

The modern airport is several kilometres south of the town. AURA will provide a bus service from the airport to the hotels in addition to hotel courtesy buses.

Robert G. Bednarik, AURA Congress Chairman

Details about the Third AURA Congress can be found at

The AURA Home Page:
http://sunrise.sli.unimelb.edu.au/aura/Welcome

The IFRAO Home Page:
http://www.cesmap.it/ifrao/ifrao

The Spanish language AURA Congress Page:
http://www.geocities.com/ciaru/aura
(generously provided by Mario Consens, CIARU, Uruguay)

NOTES FOR CONTRIBUTORS

Manuscripts of major research papers should preferably be from 4000 to 8000 words. Longer articles will be considered on the basis of merit. Submissions should comprise the original together with two copies, typed in double-space, with a wide margin on one side of each page. Underline words to be italicised and identify each page by number and author's surname. The preferred method of submission is on an IBM compatible computer diskette, written either in MS Word or saved as an ASCII or RTF file, together with two hard copies. The content of the paper should be outlined by four to six keywords (e.g. 'Petroglyph - patination - ethnography - Pilbara') placed above the title. The manuscript must include an abstract of 50 to 100 words, summarising the article.

Spelling and punctuation in this journal follow the *Style manual for authors, editors and printers of Australian government publications* and the *Macquarie dictionary*; where the two disagree the former has precedence. Footnotes should not be used. The bibliography and references in the text should follow the IFRAO style as indicated in this issue.

If line drawings are included they must be larger than the intended published size (preferably by a factor of 1.5 to 2) and line thicknesses, stippling, lettering sizes etc. must be selected accordingly. Photographs should be black and white gloss prints of high contrast. Photographs of rock art that were obtained by physical enhancement or other interference will be categorically rejected, except for the purpose of critical discussion. In regions where traditional indigenous rock art custodians exist, their approval must be obtained before submission of any material relating to their culture, and where copyright applies the author must obtain the appropriate consent. Captions (on a separate sheet) are required for all illustrative material, together with an indication in the text as to where they, and any tables and schedules, are to be placed.

Announcements intended for a specific issue of this journal ought to be available at least two months before the month of intended publication. Text proofs are issued of all articles and must be returned promptly after correction by the author(s). Each author or group of authors receive thirty free copies of their article, additional reprints are available at cost.

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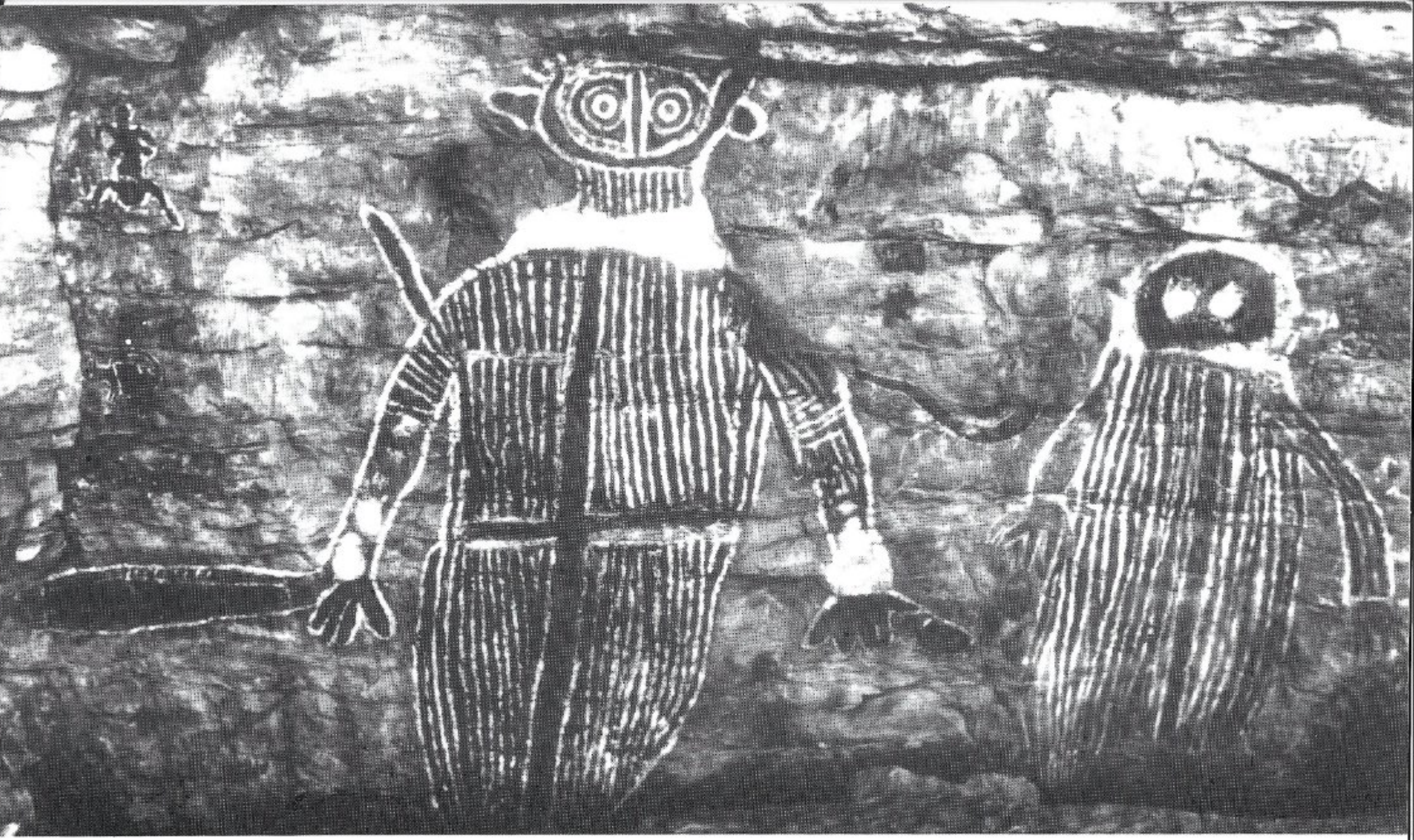

The Third AURA Congress beckons — 10-14 July 2000, Alice Springs, Australia

Photograph of the Lightning Brothers by George Chaloupka.