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Boat images found at Stuberg I, Stjørdal, central Norway.
(Figure 4 of article by K. Sognnes and A. Haug, see page 103. Photograph by K. Sognnes.)

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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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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The contents of this journal are listed in the *International Current Awareness Services* and in the *International Bibliography of Social Science*.
Major papers are abstracted by international abstracting services.

KEYWORDS: *Hand prints - Technique - Luritja - Central Australia*

PATTERNED HAND PRINTS: A UNIQUE FORM FROM CENTRAL AUSTRALIA

R. G. Gunn

Abstract. A unique form of hand print was recorded from the Levi Range in central Australia. It appeared to be a type of monoprint whereby a design was inscribed on the palm prior to the hand being pressed (printed) onto the rock face. To date 109 examples have been recorded from nine shelters in two separate rock art complexes. The art of both complexes is dominated by hand stencils, though small numbers of standard hand prints also occur. These patterned hand prints appeared to be a recent addition to the repertoire and hence are seen as yet another example of the apparent archaeological variety of the late Holocene.

Introduction

A number of hand prints with an unusual form of internal decoration were located in the Levi Range, south-west of Alice Springs (Figure 1) during a project recording the archaeology and ethnography of two art site complexes (Zukowski 1994; Gunn 1995a. 1995b; Gunn and Thorn 1997; Thorley and Gunn 1997; Thorley 1998, in prep.). These were initially termed 'textured' hand prints (Gunn 1995a), but following replication experiments, 'patterned' or 'decorated' was deemed to be a more appropriate term.

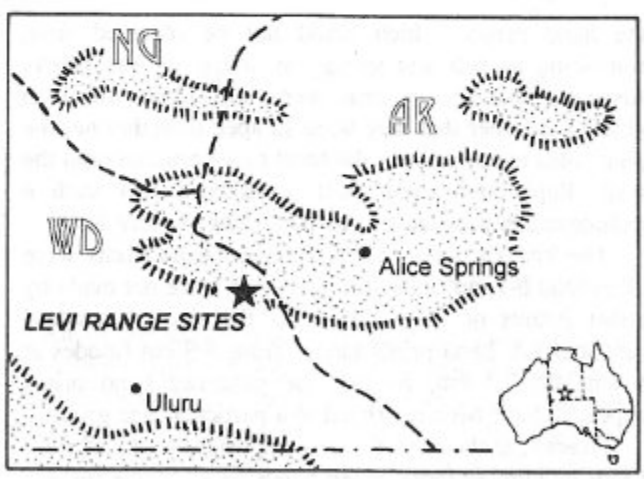

Figure 1. Location of the Levi Range site complexes showing approximate language boundaries (from Strehlow 1965 and Hobson 1990).
AR = *Arandic*
WD = *Western Desert including Luritja*
NG = *Ngarric*

While standard-form hand prints are common throughout the continent (McCarthy 1979: 80), no such patterned hand prints have previously been reported in the Australian literature. Similar patterned prints occur in south-west U.S.A. (Grant 1967: 55, 108; C. Patterson, pers. comm. 1998) though, from a superficial reading of the international literature, they do not appear to be recorded elsewhere.

Technical aspects

Overall, 109 examples of patterned hand prints were recorded from nine shelters (Table 1). Figures 2 and 3 show a range of the type of patterns recorded. These patterns had a common structure, though all differed in detail, suggesting that they were a form of monoprint printed from a prepared hand.

Site	No of P-Hpts	No of standard Hpts	No of stencils
KM13	**76**	32	1076
KM1	**16**	94	1762
KM14	**7**	2	317
TK1	**4**	27	223
TK7	**4**	3	363
TK11	**1**	27	218
TK15	**1**	8	126
Total	**109**	193	4085

KM = Kulpi Mara
TK = Irtikiri

Table 1. Number of patterned hand prints (P-Hpts) per site.

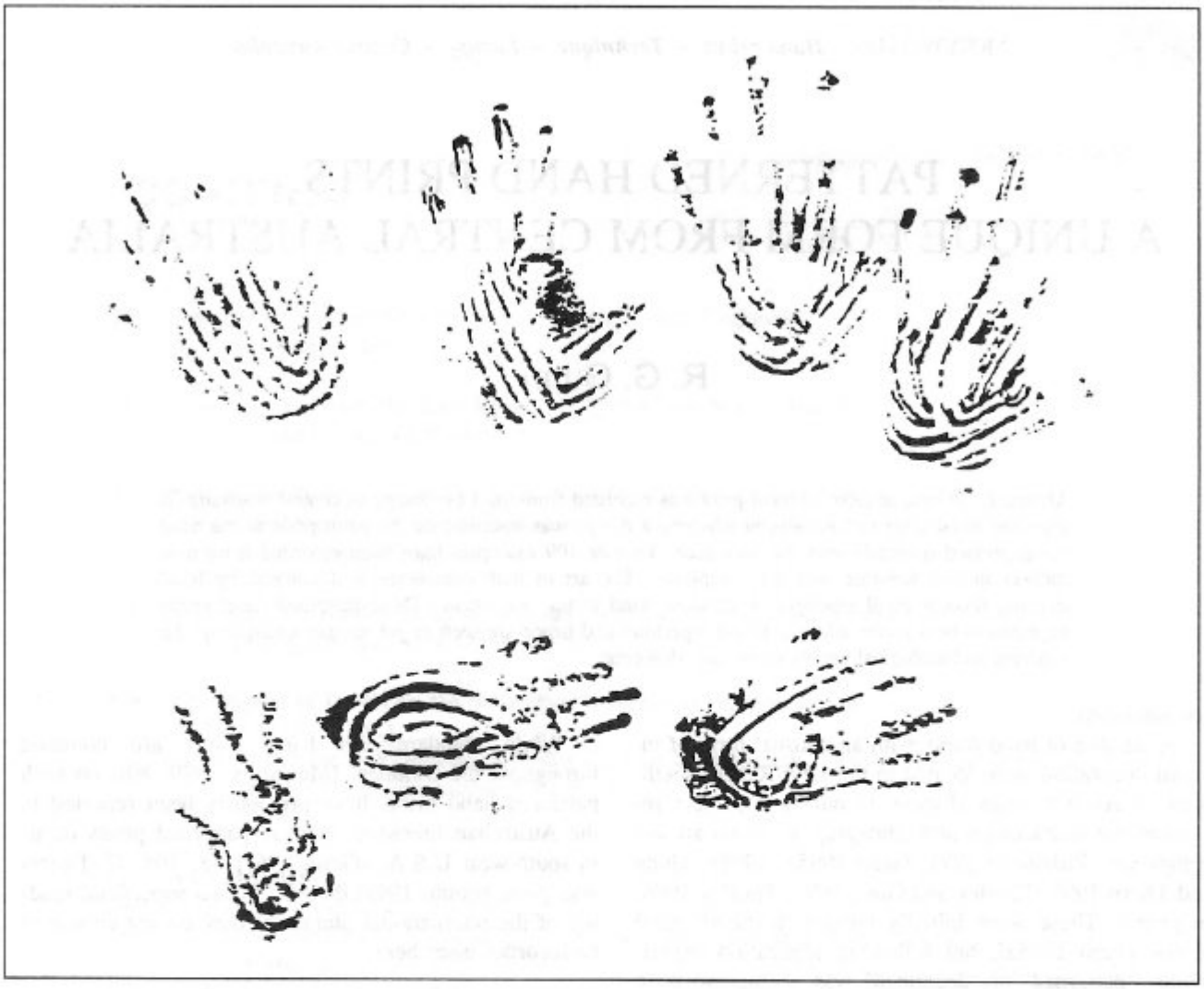

Figure 2. Panel of patterned hand prints from Kulpi Mara KM13. (Traced from photograph.)

Hands can be prepared for printing in a number of different ways. As the width and organisation of the lines on the hand prints are similar to those on engraved wooden implements (Berndt and Berndt 1982: 122; author's pers. collection), it was initially thought that the patterns on these prints had been produced by the imprinter obtaining pigment from a textured container, such as an engraved coolamon or woomera. However, on closer examination it was noticed that all of the print patterns had a 'swirl' or 'heel' on or near the ball of the thumb, and that none of these swirls were the same. This discounted the use of textured objects, as prints lifted from these would have had essentially the same pattern. The next possibility was that they were derived from pigment applied from a rolled skein of hair-string such as is seen in string prints in the Dulcie Ranges, Arnhem Land and the Victoria River region (Gunn 1992; Chaloupka 1984: 20; Gunn 1989). Here the skein would be recoiled each time pigment was added, thus giving similar patterns but with each one having a unique internal design. This idea was also discarded after an assessment of the regularity and crisp clarity of the pattern lines on the hand prints, which could not be obtained from something as soft and spongy as string. It was finally suspected that the patterns were not 'lifted' from an object but rather that they were scraped directly onto the pigmented hand, prior to the hand being pressed onto the wall. Replication experiments confirmed that such a technique can produce similar patterning (Figure 4).

The knuckle sizes of the patterned hand prints were all around 6-7 cm, indicating that they were not made by either infants or adult males. As the size of standard (unpatterned) hand prints ranges from 5-9 cm (modes at 6 cm and 7.5 cm; n=14), the patterned hand prints appear to have been restricted to a particular age group.

Overall, at the Levi Range complexes, prints of right hands outnumber those of left hands by 4 : 1 (the reverse of hand stencils which is 1 : 4). No reliable counts were taken of the patterned hand prints because of their generally poor condition (on most the location of the thumb could not be identified) but there appeared to have been more left hands than right. (This would be expected as a reflection of the tendency for right-handed people to draw with their right hand onto their left.)

Figure 3. Patterned hand prints from Kulpi Mara KM13. (Traced from photographs.)

All of the patterned hand prints were produced in a distinctive purple-red pigment with a metallic sheen. At one site (KM13) the same pigment was also used for other hand prints and stencils, suggesting that the three groups are contemporary. The pigment was also used for the principal painted motifs at Irtikiri, which are thought to be among the most recent at that complex. KM13 also contains a suite of stencils of both traditional and contact-period (mechanical) objects that are in similar states of preservation, implying that both traditional and innovative stencilling was being produced during the contact period (< 100 years ago).

At Kulpi Mara, the sites with patterned prints had high motif numbers and a corresponding high variety of techniques, colours, forms and motif types. Similarly, those sites with patterned hand prints at Irtikiri, while not the densest art sites, are within the category of sites with high motif numbers. Both sets of sites also contain a range of other archaeological attributes indicating they were favoured for general occupation as well as for art production. The lack of any simple correlation between the number of patterned and standard hand prints (Table 1) indicates that the two forms were independent even if contemporary.

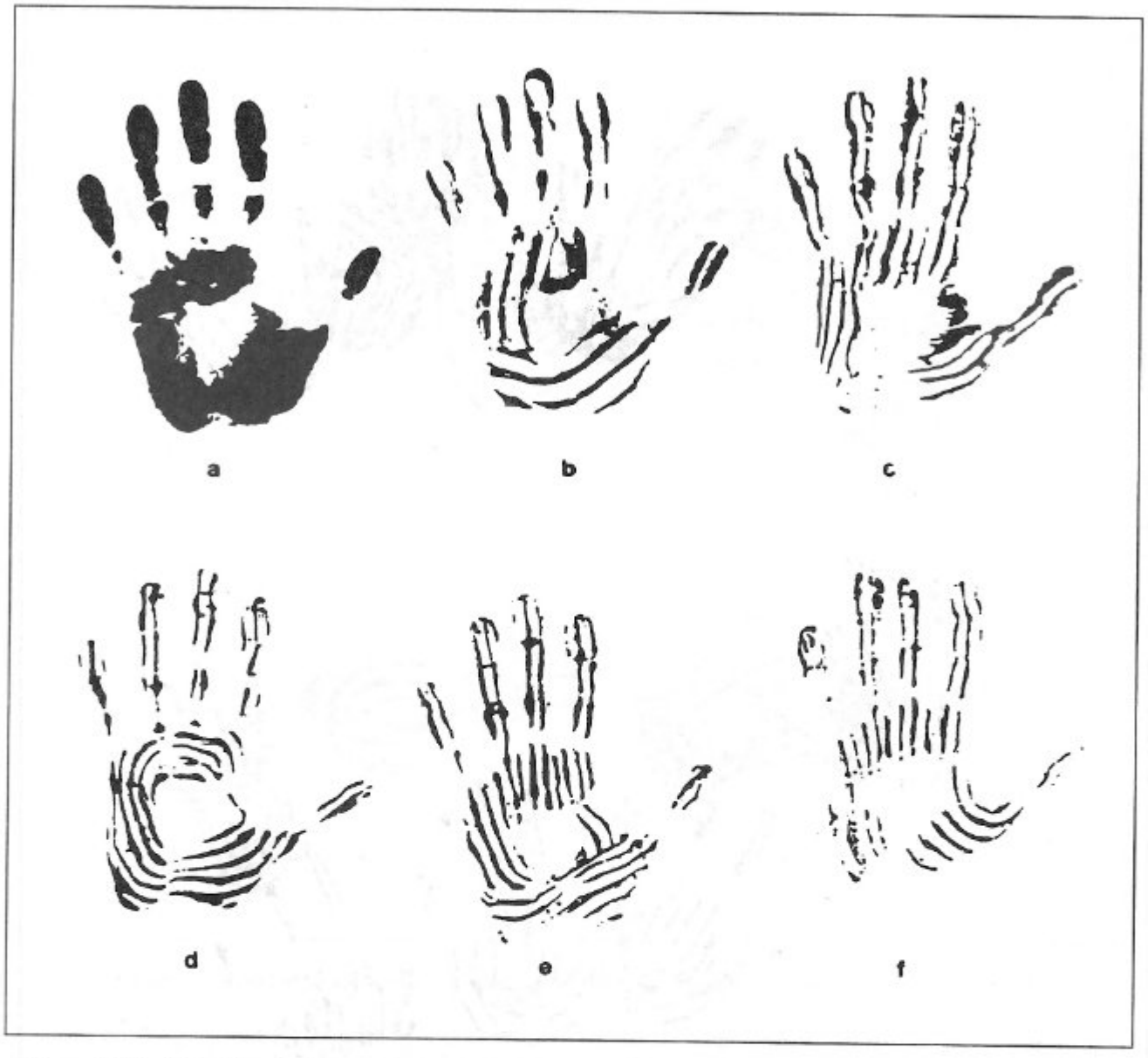

Figure 4. Replicated hand prints: (a) standard form, (b) pattern scraped onto palm with finger-nail of right hand, (c) - (f) patterned with blunt twig.

Context

Kulpi Mara and Irtikiri are two major rock art complexes near the crest of a prominent ridge-line in the Levi Ranges. The area is within the traditional lands of the Luritja - Matutjara-speaking peoples. It is, however, close to the boundary between these Western Desert people and their Central Desert (Arandic) neighbours. It is therefore close to the linguistic and cultural boundary for two groups that have a long history of both conflict and co-operation (Thorley and Gunn 1996).

The adjacent James and Gill Ranges contain 'some of the best watered country in Central Australia ... (which) appears to have been one of the most densely populated parts' (Smith 1988: 159). While doubtless having a resident population of Luritja-speaking people, in times of severe drought the area was also used by the sandhill people to the south and south-west (Finlayson 1935; Hamilton and Vauchon 1985; Davis and Prescott 1992 — though, as Sutton 1995 shows, the latter's discussion on territories and territoriality should be read with caution). The rockholes at Kulpi Mara and Irtikiri are small and no longer permanent. If this were the situation over the past several thousand years, then the use of these sites would have been limited during such drought periods. The quantity of rock art and occupation debris, however, indicates the sites were intensively used. This then suggests that such minor water reserves were utilised whenever they were replenished by local rains (cf. Strehlow 1965).

From 1885 to 1912 the range became the principal retreat for Aboriginal parties who put up a prolonged and fierce resistance to the intrusion of cattle and settlers into their lands. In human terms, however, the battle was essentially one-sided, with the establishment of po-

lice camps adjacent to Tempe Downs and the appointment of the notorious Mounted Constable W. H. Wiltshire who was later tried for the murder of Aborigines on Tempe Downs. The large-scale murders and dislocation of the traditional owners also promoted intertribal skirmishes, particularly with the displaced Arrernte to the east (Davis and Prescott 1992: 89-91; Smith and Rosenfeld 1992: 75ff.).

The Kulpi Mara and Irtikiri complexes are similar to other rockshelter complexes in central Australia in that they consist of a suite of shelter sites facing onto a large open campsite, which itself is centred around an ephemeral water source (rockholes). The rock painting sites (those shelters with stencils and/or paintings) formed a group that consisted of a principal site (KM1 with 1906 rock paintings and TK46 with 721), a small number of adjacent secondary sites (or local focal sites such as KM13), and a surrounding suite of satellite sites with relatively few rock paintings or other signs of use.

ART ATTRIBUTES	Kulpi Mara	Irtikiri	AG	Total
No of P-Hpts	99	10		109
No of site with P-Hpts	3	4		7
Total No of motifs	5614	5858	180	11652
Total No of sites	42	83	6	131
PICTOGRAPHS (%)				
Handstencils	82	87	97	84
Handprints	10	4	0	7
Objectstencils	3	2	3	4
Paintings	2	7	0	4
red &/or purple*	**99**	**96**	**100**	**98**
yellow	<1	2		1
white	<1	2		1
PETROGLYPHS (n)				
Peckings	751	31		782
Abradings	587		3	590

* The metallic purple observed at Irtikiri was recorded as a metallic red at Illararri, and at all complexes there are varying degrees of chroma making the distinction between purple and red somewhat subjective. The pigment does, however, seem to be more common at Irtikiri.

Table 2. Art attribute frequencies for three Levi Range complexes.

The rock art at both complexes consisted of a basic repertoire of hand stencils, with a minor component of hand prints, object stencils, paintings and trace numbers of drawings and unpatinated petroglyphs (Table 2). The complexes also contained concentrations of very weathered, 'Panaramitee' petroglyphs and abraded grooves that clearly represent an earlier chronological period of art production (cf. Edwards 1966, 1971). (The petroglyphs of central Australia will be discussed in some detail in a forthcoming paper.)

The similar proportions of rock painting attributes from here and other complexes in the region (Table 2) suggest that the complexes are part of a single regional artistic block. Within the recent past (and possibly over the past 1000 years or so), the art of this block was dominated by red-purple hand stencils, with small numbers of object stencils, hand prints and paintings. The limited use of white and yellow pigments throughout the block is seen as significant as both colours are common in art complexes further to the east and south (Walsh 1988; Mountford 1976).

While hand stencils occur in numbers throughout the complex, the other techniques are largely restricted to the major and secondary sites (i.e. those sites with the greatest number of motifs also have the greatest variety of techniques).

Age

The painting panels at most sites are formed of poorly cemented sandstone. The surviving surfaces and their paintings are therefore not seen as having a very great antiquity (i.e. <2000 years), though from floor deposits shelter KM13 shelter has been occupied during the past 30 000 years (Thorley 1998). Also, while patterned hand prints did not appear to be among the most recent paintings in their respective shelters, they were in some instances superimposed on, and hence postdate, earlier hand stencils. This suggests that patterned hand prints are neither among the earliest nor the most recent motifs at the complex. They are, however, considered to be a reasonably recent addition to the repertoire. This interpretation conforms to the pattern elsewhere in the archaeological record where floor deposits reveal an increase in the density and range of artefact types (and hence occupation) within the late Holocene (Smith 1988: 323-6; Thorley 1998).

Discussion

The concentrated occurrence of patterned hand prints within KM13 and lesser occurrence elsewhere suggest that they may have been the products of a single group of people (family, related women or youths) over a limited period of time. Further, it appears this group used Kulpi Mara more than Irtikiri, though clearly use was made of both complexes. Within Kulpi Mara, KM13 was the preferred shelter but also with substantial use of KM1, and to a lesser extent KM14. These three sites are the foci of occupation for the three shelter subsets in the complex and therefore the group can be seen to parallel the general use of the area. In contrast, the low number of patterned hand prints at Irtikiri and their distribution within the central sub-group of shelters is at odds with the distribution of the art that is focused within the eastern shelter group. This implies that the makers of the patterned hand prints spent more of their time at Kulpi Mara, though a discussion of the social implications of these findings is beyond the scope of this present paper.

Conclusion

The location of a unique form of hand print is discussed and its method of production assessed. The lack of any other such hand prints recorded in the Australian literature suggests that it may be a localised feature from

the more recent period of the complex's use, and coincident with an increase in the use of object stencils and clustered hand stencils, painting and drawing.

Acknowledgments

My thanks go to the Senior Traditional Owner of Kulpi Mara, Syd Coulthard of Ukaka for his permission to record the site and his support of the project. Walter Zukowski, Peter Thorley and Andrew Thorn assisted with the fieldwork. Discussions were held with Walter and Peter in the early stages and both commented on the draft. An abbreviated form was presented to the Canberra AURA Symposium in February 1998 and the comments from the floor are also acknowledged. The recording project was funded by a NEG grant (1994) from the Australian Heritage Commission and a RAPP grant (1996) from the Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra. Thanks also to the two anonymous reviewers for help with my grammar.

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Résumé. *Une forme unique d'empreinte de main a été enregistré aux Monts Levi en Australie centrale. Celle-ci semblait être un genre de mono-empreinte oú un motif était fixé sur la paume avant de presser (imprimer) la main sur la paroi rocheuse. A présent 109 spécimens ont été enregistrés de neuf abris appartenant à deux ensembles distincts d'art rupestre. Les mains imprimées dominent l'art des deux essembles, bien qu'il y ait aussi quelques empreintes de main standard. Ces mains imprimées à motifs semblaient être une récente addition au répertoire et on les regarde donc comme un autre exemple de l'apparente variété archéologique de l'Holocène récent.*

Zusammenfassung. *Eine einmalige Form von Handabdrücken wurde in den Levi Bergen von Zentralaustralian registriert. Es scheint sich dabei um eine Art von Mono-Drucken zu handeln, in denen ein Muster erst auf die Handfläche aufgetragen und dann gegen die Felsfläche gepresst (gedruckt) wurde. Bisher sind davon 109 Beispiele in neun Abris zweier Felskunstkomplexe gefunden worden. Die Kunst beider Komplexe wird von Handnegativen dominiert, obgleich eine kleine Zahl normaler Handabdrücke ebenfalls vorkommt. Diese gemusterten Handabdrücke sind anscheinend eine jüngere Addition des Inventars und werden daher als ein weiteres Beispiel der anscheinenden archäologischen Mannigfaltigkeit des späten Holozäns betrachtet.*

Resumen. *Una forma única de impronta de mano fue documentada en Levi Range en Australia central. Resultó ser un tipo de monoimpresión por el que un diseño fue inscrito sobre la palma antes de que la mano sea presionada (impresa) sobre la cara de la roca. Hasta la fecha 109 ejemplos han sido registrados en nueve abrigos en dos complejos de arte rupestre separados. El arte de ambos complejos se encuentra dominado por manos en negativo, aunque también existen pequeños números de improntas de mano standard. Estas improntas con diseños resultaron ser una adición reciente al repertorio y por lo tanto son vistas como otro ejemplo de la obvia variedad del Holoceno tardío.*

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KEYWORDS: ***Mobiliary art - Levantine Epipalaeolithic - Natufian - Negev - Core and periphery***

MOBILIARY ART FROM THE LATE EPIPALAEOLITHIC OF THE NEGEV, ISRAEL

A. N. Goring-Morris

Abstract. Two items of mobiliary art were recovered during investigations at the Late Epipalaeolithic site of Upper Besor 6 in the central Negev. The site, with durable architecture, was founded as a semi-sedentary forager basecamp during the Terminal Ramonian, contemporary with the Early Natufian. The locality continued to be occupied during the Late Natufian and was also sporadically visited during the Harifian, the local equivalent of the Final Natufian. The art pieces expand and complement the meagre repertoire in the area. Implications concerning the cultural affinities and relationships between 'core' and 'periphery' Late Epipalaeolithic communities in the Levant are addressed in light of these finds.

Introduction

Preserved artistic endeavours in the Upper Palaeolithic and Epipalaeolithic of the Levant are extremely rare prior to the Natufian, when the vast majority derive from sites in the Mediterranean zone (Bar-Yosef 1997; Belfer-Cohen 1988, 1991a; Stordeur 1981, 1992, Valla 1995; Weinstein-Evron and Belfer-Cohen 1993). It has been suggested that this sudden fluorescence in the Late Epipalaeolithic (c. 12 500 - 10 000 BP uncali-brated) reflects attempts to alleviate the social stresses involved in the shift to larger, more sedentary foraging communities (Bar-Yosef and Belfer-Cohen 1989).

For many years, research focused on Natufian sites in the Mediterranean zone, where a bipartite or tripartite chronological division is widely recognised. The considerations include stratigraphy, radiocarbon dates, techno-typology of the chipped stone tools, architectural considerations, intensity of artistic expressions, and burial practices (Belfer-Cohen 1991b; Valla 1995; Goring-Morris 1996). The Early Natufian (c. 12 500 - 11 250 BP) is often characterised as more sedentary and with an abundant artistic repertoire, in comparison to the Late (11 250 - 10 500 BP) and Final Natufian (10 500 - 10 200 BP), when there is evidence for increased mobility. This, in part at least, may reflect rapidly deteriorating environmental conditions associated with the Younger Dryas (Baruch 1994; Goring-Morris and Belfer-Cohen 1997; Moore and Hillman 1992).

Based upon the available data concerning the presence/absence and quantities of various categories in the material record, opinions vary somewhat, however, as to the nature of relationships of Natufian populations with more mobile, contemporary groups based in adjacent semi-arid zones to the south and east. While some writers have argued for marked differentiation between the Mediterranean 'core' area Natufian and other coeval groups in more peripheral areas (e.g. Bar-Yosef and Meadow 1995; Belfer-Cohen 1989; Olszewski 1986), others tend to emphasise a more clinal approach for the Levant, with a mosaic of closely inter-related regional facies and phases within both Mediterranean and Irano-Turanian zones, some more sedentary and others more mobile (e.g. Byrd 1989: 187; Goring-Morris 1987: 434, 1995; Henry 1977, 1981, 1989; Valla 1995).

The recent discovery of decorated artefacts during test excavations at a Natufian site in the Negev reported herein throws light upon the nature of cultural complexity in the steppe-desert regions of the south, as well as the nature of relationships with the Mediterranean zone.

Upper Besor 6

During the course of recent test excavations at the Late Epipalaeolithic occupation site of Upper Besor 6 near Sde Boqer in the central Negev (Figure 1), two items of mobiliary art were recovered, considerably expanding the known repertoire in that region. The site is located in a strategic setting, close to the watersheds separating the westward flowing Nahal Besor and Nahal Zipporim (one of the main tributaries of Nahal Lavan) from the eastward draining Nahal Zin. The location thus provides ready access to the lowland Negev dunefields to the west, the central Negev highlands to the south, the Hebron Hills to the north, as well as towards the Rift Valley in the east.

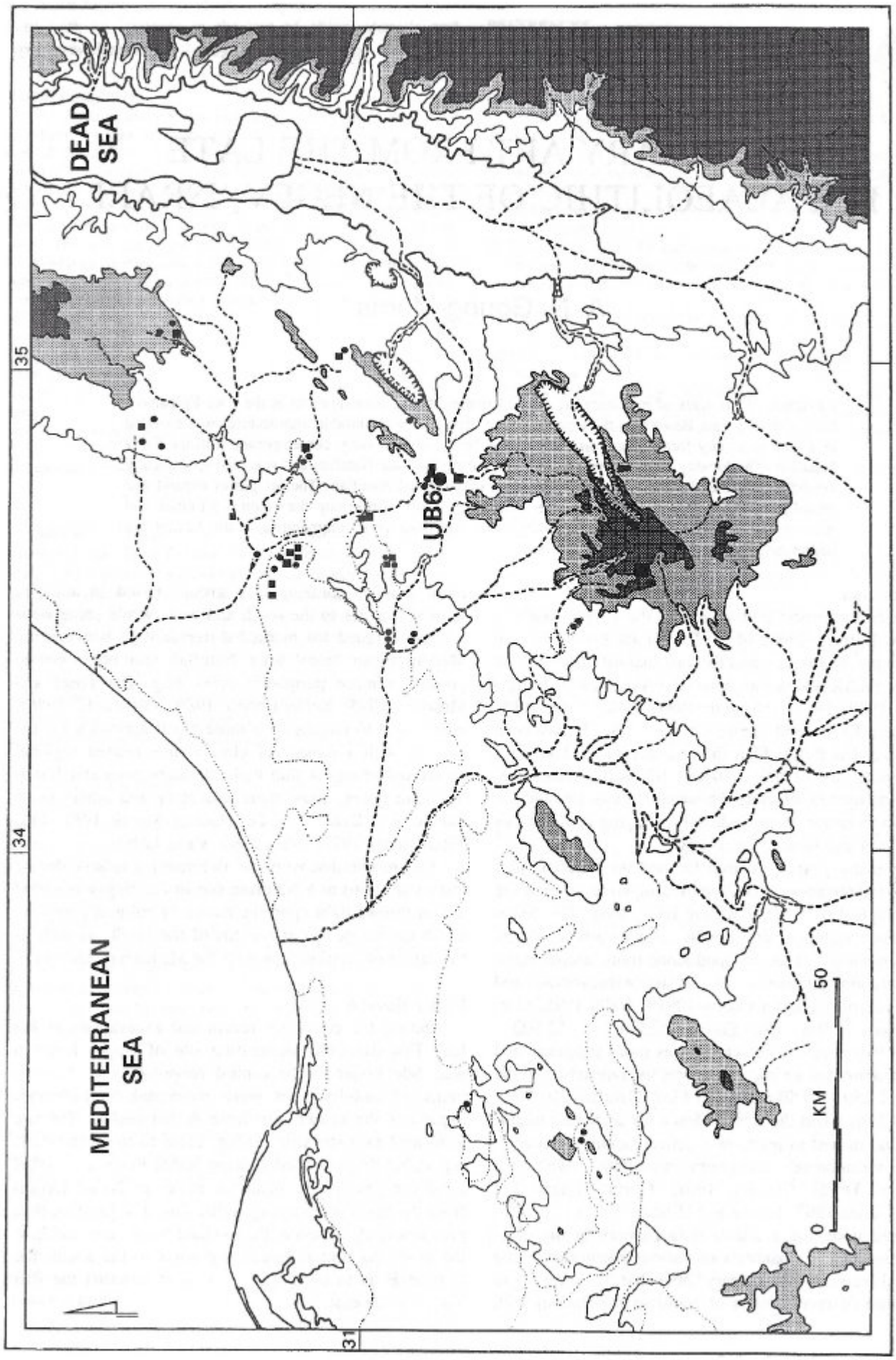

Figure 1. Map of the Negev and Sinai showing the location of Upper Besor 6 in relation to other Terminal Ramonian and/or Early Natufian (circles) and Late Natufian (squares) occurrences. Contours at 300 m intervals.

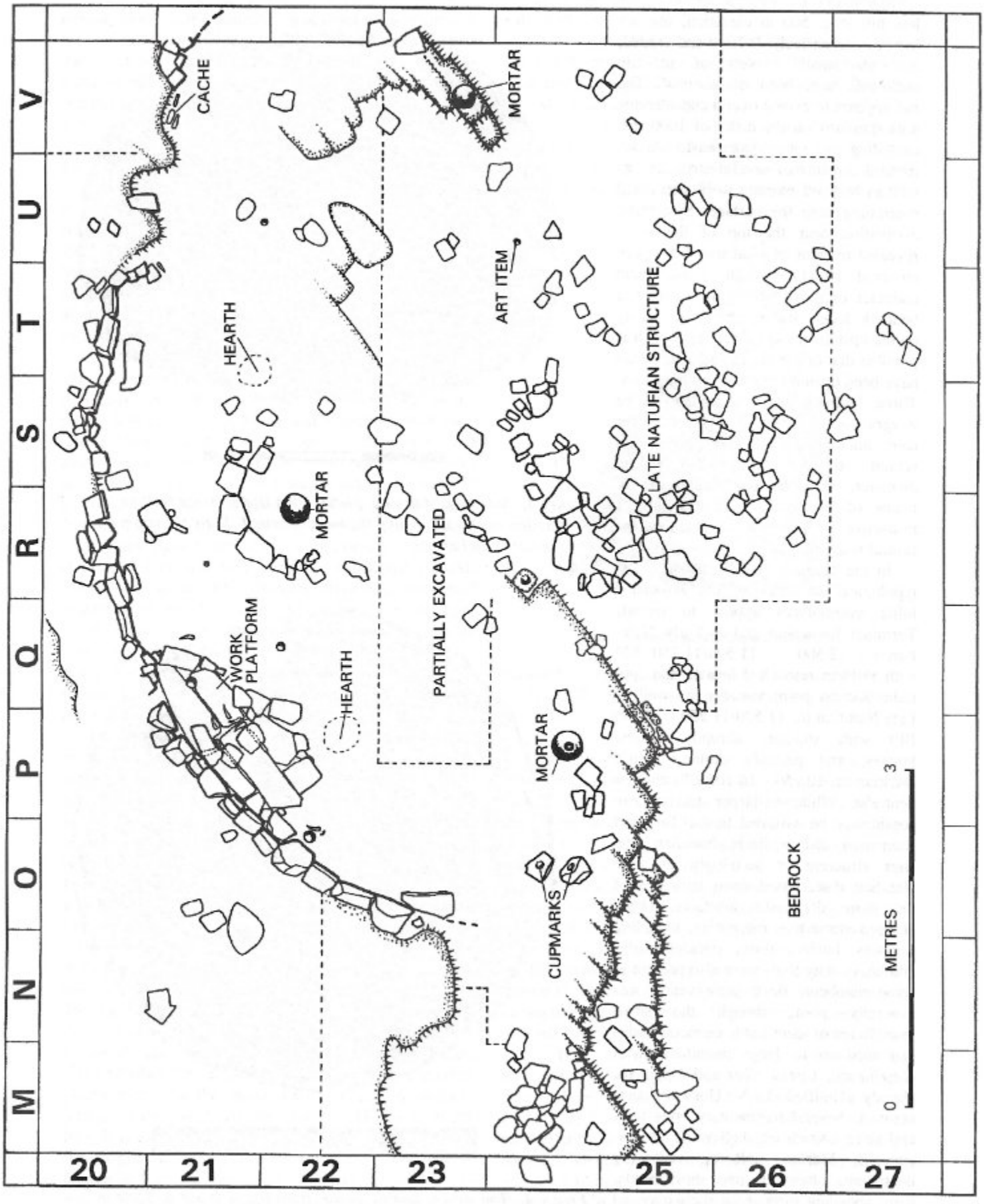

Figure 2. Plan of northern excavation area at Upper Besor 6.

Situated on the west-facing slope of a low hill at c. 500 m elevation, the site has been extensively deflated and eroded, although small pockets of in situ sediments have been documented. The site appears to extend over a considerable area (perhaps on the order of 1000 m², excluding subsequent slopewash). Architectural remains of several structures as well as bedrock mortars were also noted protruding onto the surface. Systematic excavation near the top of the slope revealed remains of what may have been an oval structure, with a maximum diameter of some 8-9 m, founded on a bedrock ledge and preserved primarily on the upslope (east) side (Figure 2). It is possible that originally this structure may have been open on the western long axis. Three bedrock mortars appear to be integral to this structure. At some later date, another smaller and poorly preserved structure, some 3-4 m in diameter, was constructed within the remains of the larger structure, and a protective retaining wall built around the central bedrock mortar.

In the absence of radiometric dates, typological attributes of the associated lithic assemblages appear to include Terminal Ramonian and/or Early Natufian (c. 12 500 - 11 500/11 250 BP) with Helwan retouched lunates and sporadic Ramon point variants, as well as Late Natufian (c. 11 500/11 250 - 10 750 BP) with smaller, abruptly backed lunates, and possibly even a minor Harifian (c. 10 750 - 10 100 BP) component also. While the larger structure can confidently be assigned to the Terminal Ramonian and/or Early Natufian, the later structure is seemingly of Late Natufian date, based upon attributes of the more diagnostic artefacts. Other chipped stone tool categories, including scrapers, burins, glossy (sickle) blades and heavy-duty tools were also present in some numbers. Bone preservation was generally poor, though the small assemblage of identifiable elements included medium to large mammals, with *Gazella* sp., *Capra ?ibex* and *Equus* sp. already identified (L. K. Horwitz, pers. comm.). Several fragmentary bone tools and some ostrich eggshell were also recovered. Marine molluscs, especially dentalium, often cut into short beads, were abundant throughout the excavated area.

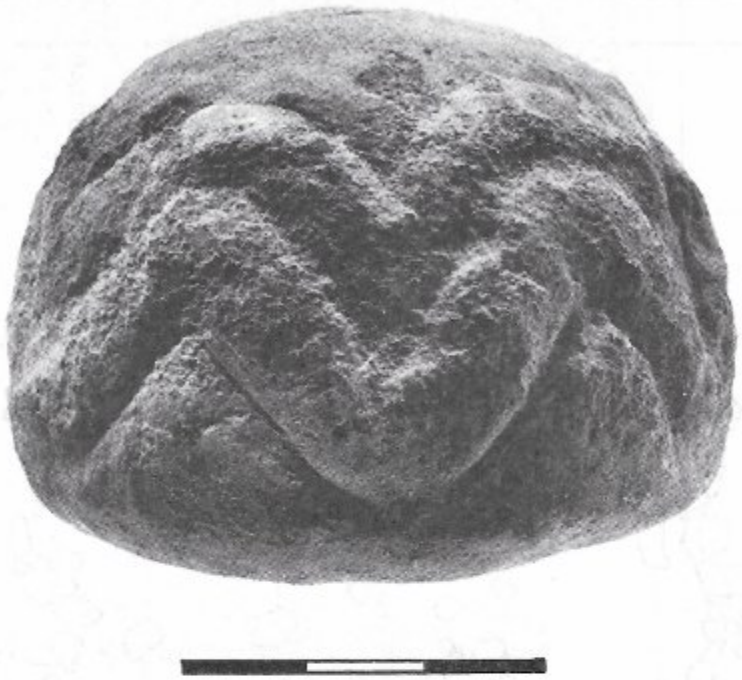

Figure 3. *Side view of domed 'pestle' from Upper Besor 6. Note incision marks delineating the meander motif. Scale in centimetres (photo: Gabi Laron).*

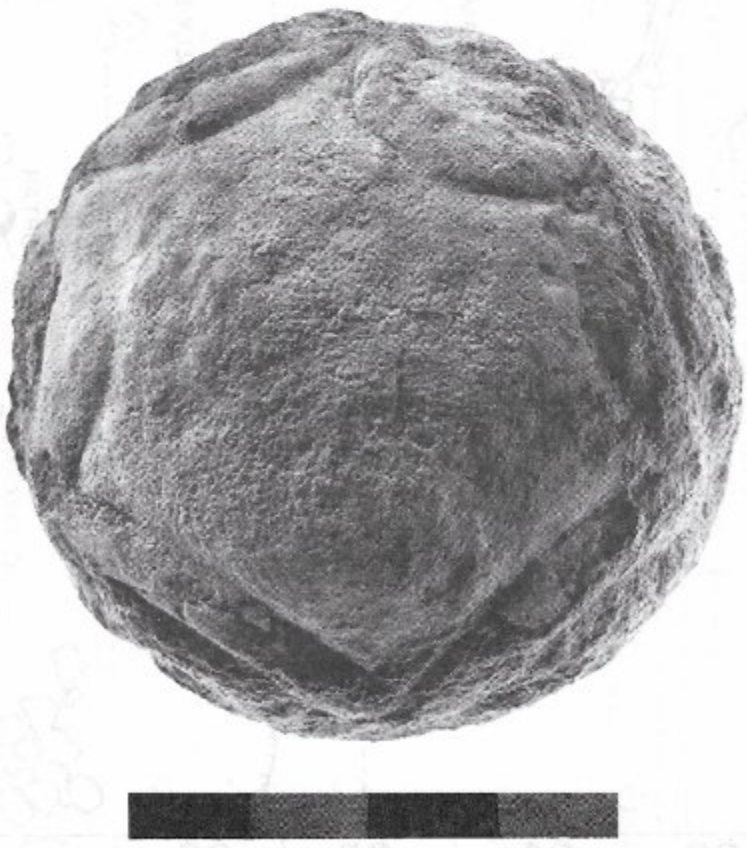

Figure 4. *Top view of domed 'pestle' from Upper Besor 6. Scale in centimetres (photo: Gabi Laron).*

The size, depth, and density of the site, together with durable stone-built architecture and other installations, as well as the nature of the smaller finds all indicate that during at least the Terminal Ramonian/Early Natufian and Late Natufian, the locality functioned as a seasonally occupied residential basecamp (see Goring-Morris 1987).

Decorated items

The first art item is a small, domed limestone piece, measuring 4.6 cm in height by 6.1 cm in diameter, and resembling a short, stubby 'pestle' (Figures 3 and 4). Recovered from grid square U24a immediately below the surface, it was carved in bas-relief around the circumference in a double meander pattern with three parallel rows of incisions 0.7-1.0 cm apart, comprising six meanders, each one being 1-1.2 cm wide, 3.5 cm apart and 3 cm high; the last meander, joining the first to create a continuous design, is slightly squashed. The meanders thus cover more than two thirds the height of the piece, leaving only the dome and slightly convex base undecorated. The meanders project slightly (2-3 mm) above the surface in the region of the apex. Cut marks are visible in the grooves of some meanders, presumably resulting from the (flint?) knife used to carve the item. Neither the base of the 'pestle' nor the rounded apex display any signs of abrasion, pitting, or any other obvious wear from use in a parochial functional context. Somewhat similar stubby 'pestles' have been recovered elsewhere in the Negev, including the Late Natufian/ ?Harifian mega-site complex of Rosh Horesha-Saflulim (pers. obs.) and the Ramonian/Late Natufian site of Nahal Neqarot rockshelter (pers. obs.; see also Belfer-Cohen et al. 1991) — in neither instance, however, with any signs of decoration.

The meander pattern of carved decoration on groundstone artefacts, such as mortars, bowls and pedestalled shaft-straighteners, is one of the more common and characteristic artistic motifs of the Natufian artistic repertoire in the Mediterranean zone. Thus it is documented at Shuqba Cave (Garrod 1942; and see Noy 1991) in western Samaria, Nahal Oren in the Carmel area (Noy 1991), Eynan in the Hula Valley (Perrot 1966), and Wadi Hammeh 27 in the central Rift Valley (Edwards 1991). In the last site, the closely related lozenge pattern is found on large non-portable slabs. El Wad and Kebara are seemingly the only reported instances where the meander pattern is carved on bone objects (Garrod and Bate 1937; Turville Petre 1932). It is interesting to note, however, the absence of the motif, until recently, amongst the otherwise abundant array of motifs found at Hayonim Cave (Belfer-Cohen 1991a; and pers. comm.). The chronological contexts for the meander pattern range from Early through Late and Final Natufian (c. 12 500 - 10 200 BP). It is accordingly difficult to precisely date the item from Upper Besor 6. The meander pattern continues to feature in the succeeding period, the Pre-Pottery Neolithic A, e.g. at Netiv Hagdud (Bar-Yosef et al. 1991). The significance of the meander design is unclear, though in much later contexts it is often associated with water and life.

The second item is a small triangular fragment (c. 1.0 × 1.5 cm) of ostrich eggshell which was recovered from grid square R22b, probably from a Late Natufian context, on the external surface of which was engraved a herring-bone pattern enclosed within two roughly parallel lines (Figure 5). This seems to frame a larger design, as indicated by the fragments of two other parallel lines incised diagonally at about 25 degrees to the main panel.

Figure 5. Engraved ostrich eggshell fragment from Upper Besor 6. Scale in millimetres (photo: Gabi Laron).

Ostrich eggshell fragments are quite commonly present in sites, sometimes in considerable quantities, from the Middle Palaeolithic through Neolithic and later, in the Negev and Sinai. Indeed, regionally the ostrich became extinct only after the turn of the 20th century. In addition to the nutritional value of the eggshells' contents, ethnographic hunter-gatherer parallels indicate probable use as canteens and containers. They were also used from at least the later Epipalaeolithic onwards as raw material for the fabrication of beads.

The incised motif on the item from Upper Besor 6 is similar to the three illustrated (of 19 recovered) engraved eggshell fragments from the Late Natufian basecamp site of Rosh Zin, located just some 5 km to the south (Henry 1976). There the drawn items display some variability, with engraved herringbone patterns and hatching within parallel lines. In the western Negev dunefields area of Nahal Rut, five incised ostrich eggshell fragments were recovered from two immediately adjacent Middle Epipalaeolithic Geometric Kebaran sites, two from Rut 48B and three from Rut 48A, as well as a single ostrich eggshell bead (Gilead and Marder 1989: Figs 9-10). In all instances the incised fragments comprise panels of paral-

lel lines, sometimes empty, sometimes with diagonal hatching or cross-hatching. Both sites are deflated and included other, intrusive Epipalaeolithic elements (Mushabian, Early through Late Natufian, and Harifian). Less than 1 km distant, a similarly incised fragment was found in the deflated Middle Epipalaeolithic Mushabian site of Nahal Nizzana XIV (Goring-Morris 1987: 195). Since all the sites in the Nahal Nizzana - Nahal Rut area are deflated and contain clearly intrusive Late Epipalaeolithic and later elements, their precise chronological attributions remain uncertain.

During the Harifian (the local Negev variant of the Final Natufian), c. 10 750 - 10 100 BP, a somewhat similar bone spatula incised with a complex criss-cross sub-geometric pattern divided into panels was recovered from the highland basecamp site of Abu Salem (Scott 1977: Fig. 11-20a). At nearby Ramat Harif, incised hatched lines also appear on a bottle-shaped fossil and rock crystals (Goring-Morris 1991: Fig. 12). At Shunera XXIV there is a circular perforated limestone plaque with lightly incised short lines at right angles around the periphery (Goring-Morris 1991: Fig. 11).

Elsewhere in the Levant the concept of engraving hatched and 'ladder' patterns enclosed within panels is characteristic of art endeavours throughout the Epipalaeolithic sequence, being already known from Early Epipalaeolithic Kebaran contexts in the Levant, e.g. Urkan e-Rubb (Hovers 1990) and Jiita II (Copeland and Hours 1977). The herringbone motif, however, does not seem to be documented prior to the Late Epipalaeolithic. It is interesting to note that these panelled motifs appear to be preconceived in terms of matching the precise pattern to the shape of the object, rather than as sequential notation schemes.

Discussion

The presence of decorated items at Upper Besor 6 in the central Negev is of considerable interest in terms of interpreting the cultural affinities and relationships between pre-Historic communities in the Mediterranean and semi-arid zones during the Late Epipalaeolithic.

The Late Epipalaeolithic in the Levant, c. 12 500 - 10 100 BP, is commonly considered to be broadly synonymous with the Natufian Complex. Within 'core area' Mediterranean zone sedentary or semi-sedentary residential basecamp occupation sites, the material culture remains of the Natufian are commonly characterised by durable architectural remains, cemeteries, and abundant and distinctive art, bone tool, ground-stone and chipped stone tool assemblages (Belfer-Cohen 1991b). Art appears to be somewhat more common in the earlier rather than later phases. Exchange systems were seemingly well-developed on the basis of the sources and quantities of non-local items such as marine molluscs, minerals and rocks. Differing opinions have been voiced as to the precise cultural association of contemporary, more mobile Late Epipalaeolithic entities in the more peripheral, arid zones of the Levant, though there does appear to be a consensus that they are indeed related to some degree with their contemporaries in the Mediterranean zone.

In the Negev (and Sinai), this period is broadly represented by the Terminal Ramonian/Early Natufian, Late (Desert) Natufian and Harifian entities, each with its own distinctive settlement and seasonality patterns, adaptive mode and material culture repertoire. While residential basecamp sites with durable architectural remains are present in some highland localities, environmental conditions, as well as the distributions and seasonal availability of resources, seemingly necessitated more mobile adaptations over extensive territorial ranges. Hence basecamps were only seasonally occupied, supported by more transient camp sites in the western Negev and north Sinai dunefields and other lowland locales (Goring-Morris 1987). The Terminal Ramonian is thought to be a relatively mobile local adaptation, while more or less contemporary but sporadic and transient Early Natufian occupation has also been recognised, probably by groups residentially based across the Arava (Rift Valley) in southern Jordan. A probable shift from Late Natufian winter aggregation in highland locales (the Rosh Horesha-Saflulim mega-site complex) to Harifian summer occupation of the same region is thought to largely reflect deteriorating environmental conditions associated with the Younger Dryas, with changes in the seasonal exploitation of different plant resources (see Butler et al. 1977; Goring-Morris 1987, 1991; Lieberman 1993, for discussions of seasonality based upon faunal and topographical evidence).

Though several Harifian basecamp sites have been extensively excavated, Terminal Ramonian and Natufian residential sites in the Negev have so far only been tested in a more limited manner. Unfortunately bone preservation in the arid zones is frequently poor; and though some faunal assemblages (including occasional bone tools) have been recovered, no human remains whatsoever have yet been documented. Artistic products, too, are sparse. Thus the overall impression provided to date has commonly been one of relatively impoverished (in material culture terms) outliers in the semi-arid and arid periphery in relation to the Mediterranean zone.

However, this may, in part at least, be somewhat illusory, reflecting more the intensity of excavations and the vagaries of preservation and taphonomic processes in the various regions of the Levant. Furthermore, it is of interest to note that even in the 'core area', where excavations have been much more extensive, variability in the material record is marked. Thus at Shuqba, Hatoula, Salibiya I, and indeed even the Judean Desert sites, the repertoire of art items and decorated motifs appears to be quite limited in both scope and quantity (Garrod 1942; Lechevallier and Ronen 1994; Crabtree et al. 1991; Neuville 1951). In this context it is interesting to note that there is considerable uncertainty today as to the cultural affinities of at least one of the most famous art items in the Judean Desert previously ascribed to the Natufian, e.g. the copulating couple from Ain Sakhri (Boyd and Cook 1993).

Furthermore, while some motifs appear to be wide-

spread throughout much of the southern Levant, such as the bas-relief meander design on stone objects, others appear more localised, e.g. sculpture in the round, which is limited to the Carmel, and northern and central Jordan Valley.

Combined with the geographical and chronological variations and similarities in residential architectural evidence, burial practices, and aspects of the lithic, bone tool and other material culture remains, the evidence would appear to suggest two complementary modes. On the one hand, an underlying, wide-ranging, cultural heritage throughout much of the central-southern Levant for the duration of the Natufian, in which common technological, belief and ideological systems can be detected; on the other, more local traits reflecting the territorial ranges of specific groups, some more sedentary, others more mobile, depending upon the specific locality and size of the catchment areas required to support them (Goring-Morris 1987, 1995; Valla 1995). Such variability in mobility patterns would most certainly be expressed in terms of the nature and quantity of various aspects of the material culture record. Ultimately it seems that a continuum of both adaptive modes and the accompanying various facets of the material record, including the scope and quantity of art items, best accords with the available data. Within such a cline through space and time the criteria as to precisely how, where, and when to split the Natufian complex into its component parts is perhaps more straightforward when the two extremes are examined, e.g. the Carmel together with the central-upper Jordan Valley facies, as opposed to the Harifian, but more problematic in intermediate locations.

Acknowledgments

The site of Upper Besor 6 near Sde Boqer in the central Negev highlands was discovered during the course of systematic surveys conducted for the Israel Electric Corporation by the Archaeological Survey of Israel (Goring-Morris and Rosen 1987). Excavations were conducted by the author in 1995 under the auspices of the Israel Antiquities Authority, with the participation of students from the Institute of Archaeology, Hebrew University of Jerusalem. Funding was also provided by The Jerusalem Center for Anthropological Studies. The logistical support of Mr Ziv Carmel and the Sde Boqer Field School is gratefully acknowledged. The comments of the *RAR* referees are appreciated.

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Résumé. *Deux articles d'art mobilier ont été trouvés pendant des investigations au site Épipaléolithique récent de Upper Besor 6 dans le Negev central. Le site, avec une architecture durable, a été établi pour servir de camp de base semi-permanent de cueillette durant le Ramonien terminal, contemporain du Natoufien ancien. Le site continua à être habité pendant le Natoufien récent et était aussi visité sporadiquement pendant l'Harifien, l'équivalent local du Natoufien final. Les pièces d'art augmentent et complémentent le répertoire maigre de la région. A la lumière de ces découvertes, on considère les implications concernant les affinités culturelles et les rapports entre les communautés 'nucléaires' et 'périphériques' de l'Épipaléolithique récent au Levant.*

Zusammenfassung. *Zwei Stücke mobiliärer Kunst wurden während Untersuchungen der spät-epipaläolithischen Station Ober-Besor 6 in der zentralen Negev geborgen. Der Ort, mit dauerhaften Bauwerken, wurde als semi-seßhaftes Sammler-Hauptlager im Ende des Ramonian, zeitgleich mit dem Frühen Natufien, gegründet. Die Lokalität blieb während dem Späten Natufien bewohnt und wurde sporadisch auch im Harifien aufgesucht, das lokal dem End-Natufien gleichzustellen ist. Die Kunstgegenstände erweitern und bereichern das magere Inventar der Gegend. Folgerungen betreffend die kulturellen Verwandtschaften zwischen 'Kern'- und 'Peripherie'- spät-epipaläolithischen Gemeinschaften in der Levant werden im Lichte dieser Funde erörtert.*

Resumen. *Durante las investigaciones en el sitio Epipaleolítico Tardío de Upper Besor 6 en Negev central se recuperaron dos muestras de arte movible. El sitio, con arquitectura permanente, fue creado como un campamento base forrajero semi-sedentario durante el Ramonian Terminal, contemporáneo con el Natufian Temprano. El sitio continuó siende ocupado durante el Natufian Tardío y también fue esporádicamente visitado durante el Harifian, el equivalente local del Natufian Final. Las piezas de arte amplian y complementan el magro repertorio en el área. Las implicaciones concernientes a las afinidades culturales y a las relaciones entre las comunidades 'centrales' y 'periféricas' del Epipaleolítico Tardío en el Levante son mencionadas a la luz de estos hallazgos.*

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KEYWORDS: *Palaeolithic - Cave paintings - El Pendo - Cantabria - Spain*

NEW PALAEOLITHIC CAVE ART IN CUEVA DE EL PENDO, CANTABRIAN REGION, SPAIN

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Abstract. This article presents a new group of Palaeolithic cave art recently discovered in Cueva de El Pendo (Region of Cantabria, Spain). This find consists of 17 figures painted in red ochre and sienna and located on a frieze 8.8 m long and about 3 m high. The figures are homogeneous in technique and style and are typical of the Cantabrian paintings corresponding to Leroi-Gourhan's style III, through the use of the technique of dabbed dots, and such characteristic artistic conventions as the V-shaped ears in the representations of hinds, the most common animals in the group. This discovery widens the distribution area of the so-called 'Group of the Ramales School', formed by caves such as Arenaza, Covalanas or La Pasiega, all of which have art very similar to this new group of paintings in El Pendo.

Introduction

El Pendo cave is one of the most often mentioned sites in archaeological literature, and its stratigraphical sequence is frequently referred to in studies of the Palaeolithic Age in the Iberian Peninsula. Located in the centre of the Cantabrian Region, in the north of Spain, the entrance of El Pendo lies in a cliff of Aptian limestone, near the bottom of an uvala in the Peñajorao Mountain (Figure 1). This is an intensively karstified area, part of an arc around the Bay of Santander (García Mondejar 1990), providing one of the greatest concentrations of Palaeolithic sites in the south-west of Europe. El Pendo was discovered for science by Marcelino Sanz de Sautuola in 1878, and it has since been examined by numerous archaeologists, such as J. Vilanova y Piera, J. Carballo or Martínez Santaolalla. Numerous archaeological excavations since the end of last century have shown a complete stratigraphical sequence, including eighteen strata and twenty-eight different levels covering the full Würm glaciation and practically the whole of the Holocene, with a succession of cultural traditions ranging from the Mousterian to the Middle Ages. This has made the stratigraphy of the cave one of the chronostratigraphic references for south-west European pre-History, together with the nearby sites of El Castillo and Morín Caves. In 1907, H. Alcalde del Río discovered a group of engravings (an unknown quadruped and a possible Great Auk; d'Errico 1994: Figs 6 and 7) in the passage at the end of the cave, and these were the only examples of rock art known in the cave until the present time. So far, the most complete study of the cave is that of J. González Echegaray (1980), who systematised all the work carried out in the cave, especially the excavations during the years from 1953 to 1957.

Since 1994, a multi-disciplinary team from various Spanish universities, co-ordinated and led by R. Montes Barquín and J. Sanguino González, have been working in El Pendo Cave, with the primary aim of obtaining palaeo-environmental and palaeo-economic data for the early Upper Pleistocene, as well as recording a series of ritual and funerary structures dated to the late Bronze Age.

During the 1997 operations, actually on the last day, while the last archaeological materials from the so-called 'Bronze Age shrine' were being collected, a series of red lines were accidentally discovered on the wall above the highest part of the 'shrine', where the main chamber of El Pendo finishes at the entry to the lower, narrower and darker part of the cave. This discovery was made by Carlos G. Luque (surveyor), José M. Morlote Expósito and Angeles Valle Gómez (the archaeologists in charge of the Bronze Age materials).

Situation of the paintings and description of their environment

El Pendo was formed by a small stream progressively cutting its course through horizontal limestone beds. It can now only be explored for a short distance, 150 m, but the cave is of massive proportions, consisting of a main chamber 80 m long, 45 m wide and 25 m high (Figure 2). This is followed by a narrow meandering passage which is blocked by clays and silts of fluvial origin, marking the end of the cave, which is the location of the engravings discovered in 1907.

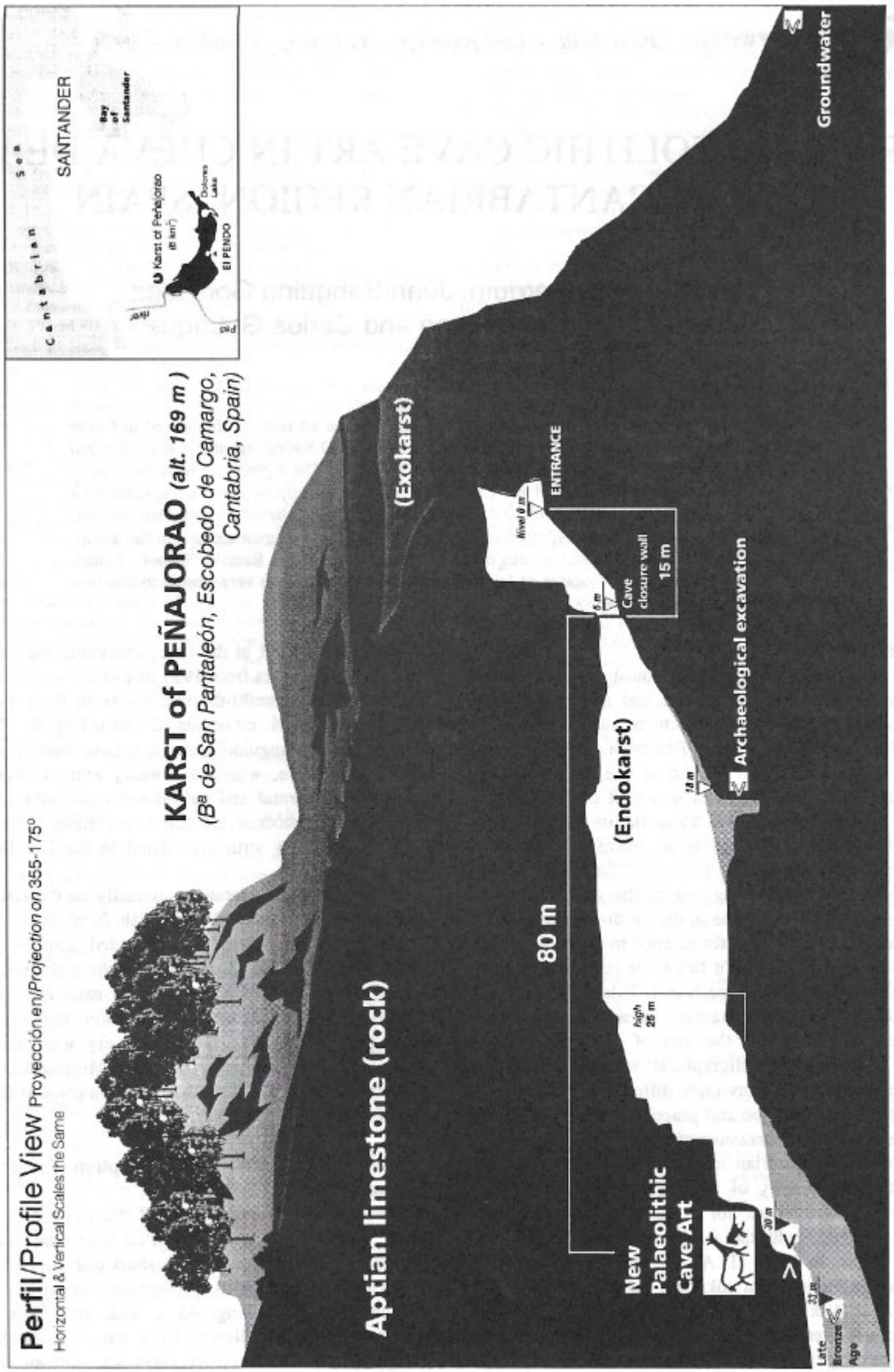


Figure 1. Cross-section of Cueva de El Pendo, Cantabria, Spain.

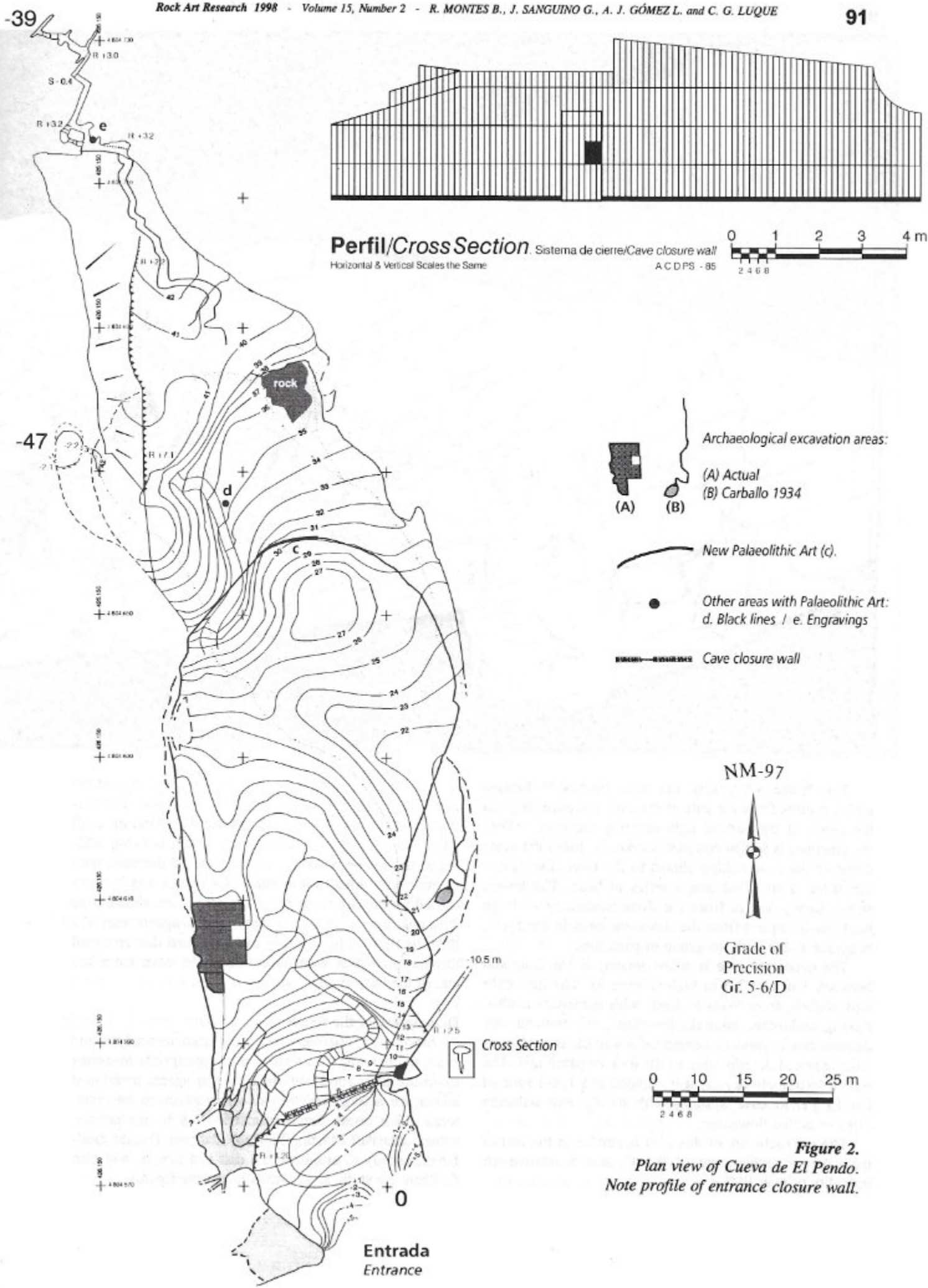
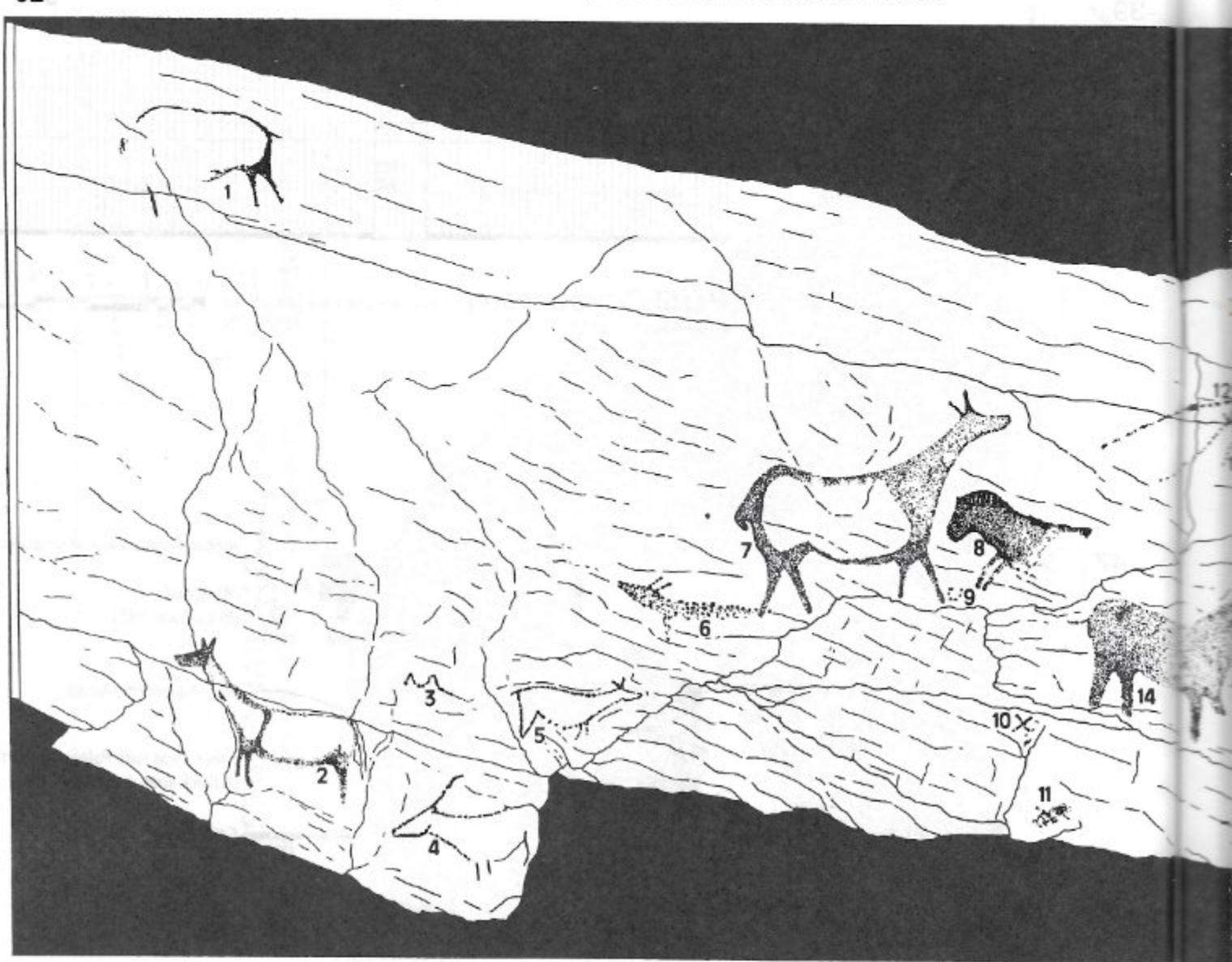


Figure 2.
Plan view of Cueva de El Pendo.
Note profile of entrance closure wall.



The frieze supporting the new figures is located eighty metres from the gate at the cave entrance, beyond the reach of the natural light entering the cave, where the chamber is left in complete darkness. From the great dome of the cave ceiling almost to the floor, the Aptian limestone is stratified into a series of beds. The lowest strata, barely 1.5 m from the floor (consisting of large boulders collapsed from the limestone beds in the roof), bears the frieze with the group of paintings.

The decorated area is approximately 8.8 m long and between 3 m and 3.5 m high (Figure 3). The limestone dips slightly from West to East, with numerous cracks, flaking and other natural alterations, but without any damage due to modern human causes (such as graffiti or other types of deterioration to the rock or paintings). The wall is extremely dry, as it is situated in a fossil zone of the El Pendo cave system, with hardly any stalactite drips or active flowstone.

The microclimate of this area is similar to the rest of the cave: a temperature of 9.5°C, and a relative air humidity of over 96%.

The dryness of the wall has, nevertheless, caused the iron oxide paint to be absorbed by the rock. Furthermore, all this area has been colonised by a kind of small white lichen (*Caloplaca murorum*), which is being studied at the moment, as has all the area of the cave with natural light. Finally, the numerous cracks and hollows caused by the deterioration of the rock have allowed the accumulation of dust and dirt. These agents partially hide the figures; hence, they had remained unseen by all the archaeologists who have visited the cave since the end of the last century.

Description of the figures

Since their discovery we have tried to analyse and study the paintings, as well as take appropriate measures to ensure their conservation, since the agents mentioned above are a long-term threat which needs to be countered. As a result, the work carried out by the conservators, Maribel Martín, Pierre Vidal and Eudald Guillamet, mainly to eliminate the dirt and lichen, will also facilitate the study and observation of the figures.

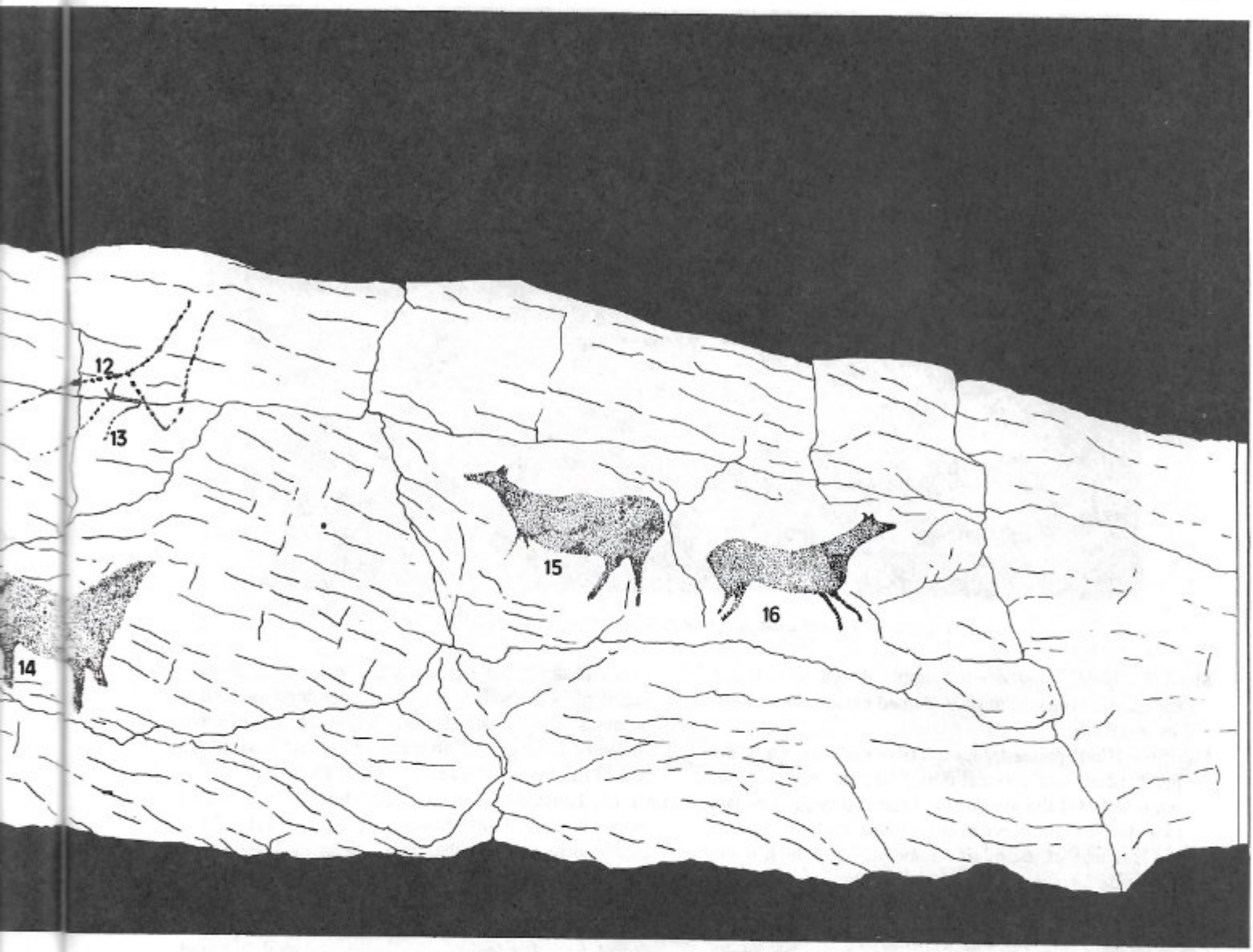


Figure 3. The frieze of rock paintings discovered in El Pendo.

The group of rock paintings is dominated by the figures of 'hinds', seven apparently identifiable figures and two probable ones, and also includes a 'goat', a 'horse', three indeterminate quadrupeds, two 'signs' and various other dots and lines.

These figures have been numbered from left to right (Figure 3), as they are listed in the following inventory:

Motif 1. Indeterminate quadruped (possibly a bovine), located more than 4 m above the present floor (boulders), on the upper part of the frieze. Its rear quarters are fully painted-in, the cervical-dorsal line including a prominent hump is painted as a single continuous line, while various patches of colour belong to its forequarters. The figure still has not been examined in detail due to its position. Its measurements are approximately 75 × 35 cm.

Motif 2. 'Hind' painted with two techniques: overlapping dots and colour-wash, using the form of the rock to complete the lower part of the neck, the cervical-dorsal line and the croup. The dividing lines at its front quarters are characteristic. The mouth of this motif has been drawn on a different rock face from the rest of the animal, which measures about 85 × 30 cm.

Motif 3. 'Sign' painted with the overlapping dot technique, consisting of two protuberances and a curved line. It could be interpreted as a serpentiform. It measures 28 × 7 cm.

Motif 4. Front of a caprid consisting of the head, neck and horn, painted with overlapping dots. The natural form of the rock completes the rear quarters, belly and front legs. The paint has been added to this natural relief to create the complete figure of a goat. Its dimensions: 60 × 40 cm.

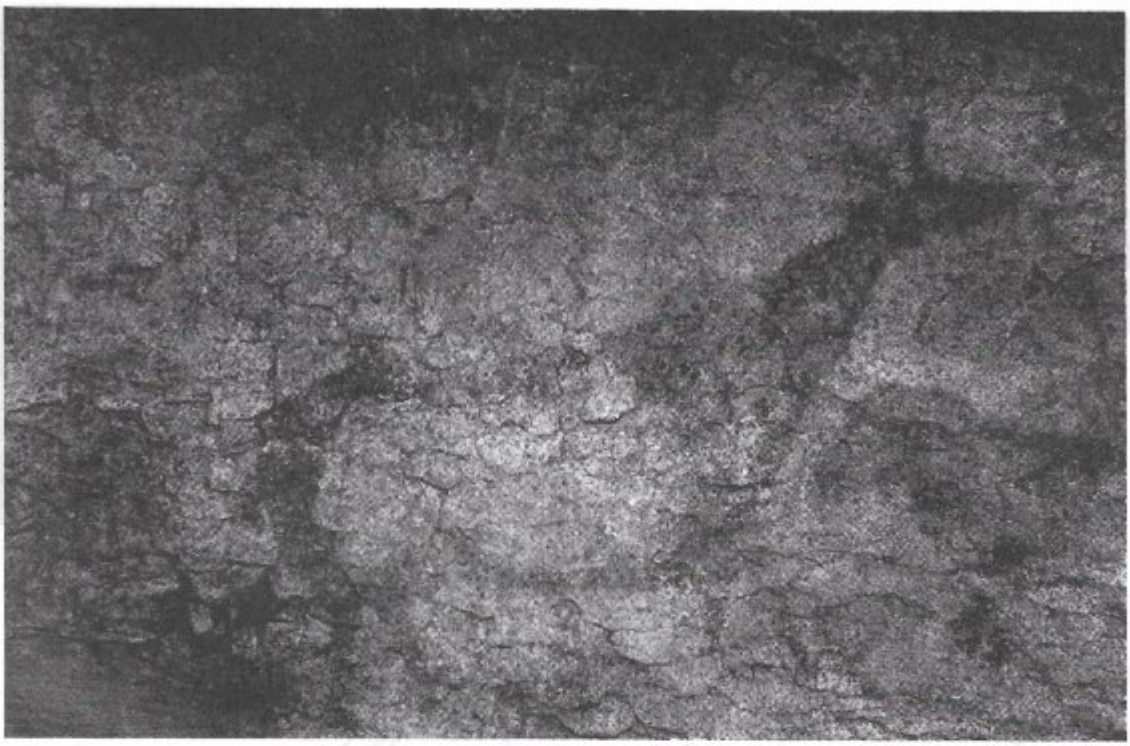


Figure 4. Quadruped painting resembling a hind, motif 7.

Motif 5. 'Hind' painted with simple dotted line. It has the classic convention of V-shaped ears and measures 48 × 16 cm.

Motif 6. 'Hind' painted with overlapping dots. Only the head, neck, and cervical-dorsal line are represented, while dots fill the area of the head and neck. The last two dots of the cervical-dorsal line underlie one of the rear legs of the motif number seven, which is the only case of superposition in the whole group. It is the only figure painted in the colour sienna (limonite). Its dimensions are 70 × 30 cm.

Motif 7. Large complete 'hind', painted with the three techniques used in the frieze (simple lines, overlapping dots and colour-wash). It seems to be the central figure in the whole composition, due to both its size and the central, preponderant position it holds within this. As well as the conventional V-shaped ears, the rear quarters and the belly are fully-coloured, and the area between the forequarters and the mouth is filled with dots. It overlies motif number 6. Its dimensions are 125 × 80 cm (Figure 4).

Motif 8. Front of a 'horse' with forequarters, painted with a wide continuous line. It has a brush-type mane, indicated with up to six vertical lines. The neck and head are filled with dots. This motif appears to be associated with the central figure of the panel, number seven, which it faces in the central area of the frieze. It measures 64 × 22 cm.

Motif 9. Possible 'sign' in the shape of a vulva, represented with overlapping dots, and located between motifs 7 and 8; to be exact, at the height of both of their forequarters. Its dimensions are 6 × 4 cm.

Motif 10. Red marks apparently representing V-shaped ears and the upper part of a hind's head. It is composed of dots, both separate and overlapping, and it is quite likely that the exfoliation of some small flakes of rock in this area has led to the loss of the rest of the figure. It measures some 15 × 10 cm.

Motif 11. Isolated and unconnected lines and marks of paint situated on the lower part of the wall. They could correspond to the figure of a quadruped, but most of the pigment has been lost, and it is impossible to determine the form of the painting.

Motif 12. Front of a headless animal, painted with a dotted line. It consists of a cervical-dorsal line and the neck, with the typical lines dividing this anatomical part. It possibly corresponds to the figure of a headless hind, and in fact the head of another 'hind' (motif 13) is situated inside this figure. It measures 96 × 12 cm.

Motif 13. Head of a 'hind' painted with overlapping dots, and with V-shaped ears, situated inside the previous figure. It measures 43 × 18 cm.

Motif 14. Indeterminate headless quadruped, painted fully in red. The fragmented and cracked rock conditions and the dirt and lichen make it difficult to see this figure or to interpret it more exactly. It measures 83 × 26 cm (Figure 5).

Motif 15. Complete 'hind' painted with colour-wash and a single continuous line. It is located in a hollow in the wall. Together with motif 16, it appears to form the part of the composition closing the panel on the far right. Its dimensions are 70 × 25 cm (Figure 6).

Motif 16. Complete 'hind' painted in colour-wash and simple continuous line. It is the last figure, located at the end of the frieze, and it has dimensions of 68 ×

20 cm (Figure 7).

Motif 17. Not situated on the frieze, but towards the interior of the cave, just behind the rocky outcrop bearing motifs 2, 3, 4 and 5. A group consisting of two red circles, each of 3 cm diameter.

A few isolated dots, in red and sienna as well as in black, dispersed over the wall, complete the examples of art.

Figure 5. Headless quadruped painting, motif 14.

Figure 6. Quadruped painting resembling a hind, motif 15.

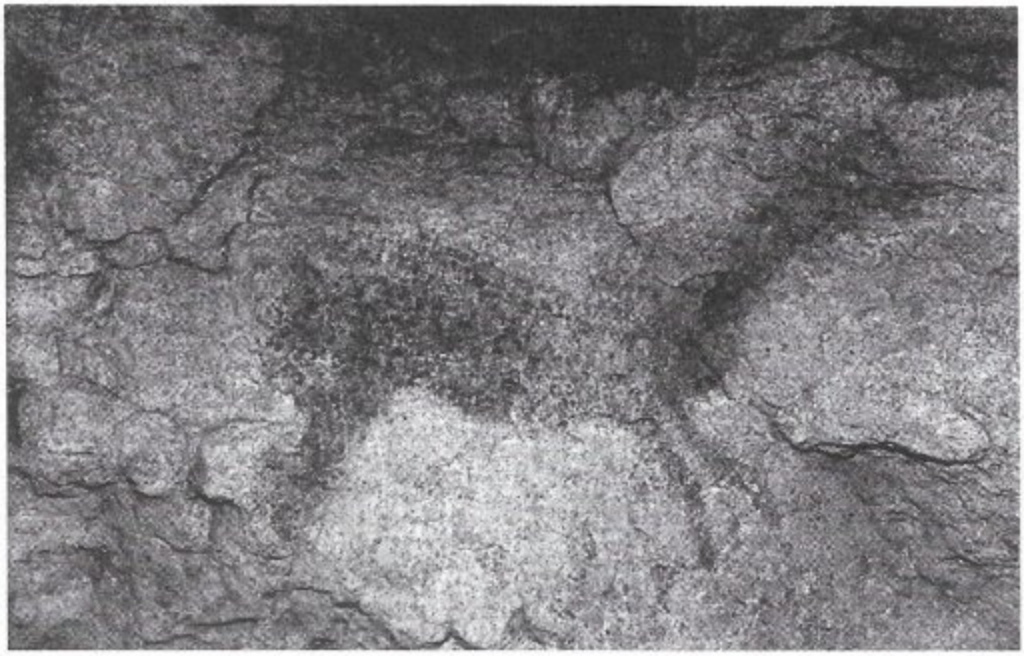


Figure 7. Quadruped painting resembling a hind, motif 16.

Preliminary appraisal

So far, three different artistic techniques have been recorded in the production of the figures: some parts of the animals are fully painted-in with a kind of colour-wash; lines were formed of dots, both separated and overlapping, which were dabbed onto the rock with a pad of some kind; and there are other simple lines that may be wide or narrow. Two or even three of these techniques are combined in some of the motifs (motif 7 is a good example, with one single line for the outline, dots in the neck and head, and fully painted colour-wash in the animal's legs and tail).

The predominant pigment is red ochre, while sienna appears in motif 6 and a few isolated dots located above it. The inventory is completed by a few isolated marks and dots in black, whose attribution to the Palaeolithic is doubtful as they are found on the lower part of the wall, immediately above several deposits of pottery and bones, which are part of the so-called 'Bronze Age shrine'.

The overall structure of the paintings on the wall suggests a unity in the composition, which apparently represents a scene. Everything seems to be articulated around a composition (motifs 7, 8 and 9) situated in the centre of the wall.

The characteristic style and technique situate this group, which may be considered as homogeneous, in a quite early stage of Leroi-Gourhan's style III, which, it is assumed, coincides chronologically with the Solutrean period and the first phases of the Magdalenian. On that basis we can tentatively attribute an age of between 18 000 and 20 000 years BP to this group, which is similar to the age proposed for paintings in caves such as Covalanas, La Haza, Arco and Pondra (all these in Ramales de la Victoria), La Garma (Omoño, Ribamontán al Monte), and with certain sectors of La Pasiega (Monte Castillo, Puente Viesgo). In all these caves there are many figures which can be compared with each of the motifs in El Pendo.

No chronological relationship has yet been established between the paintings and the level of the presumably contemporary component of the cave's stratigraphy, the Solutrean. In fact, the Solutrean level was not documented in the main sediments dug during the big excavations of 1953-57, which have been the traditional reference point for the chrono-cultural development reflected in the cave's deposits. Solutrean sediments have only been located in another sector of this huge cave, an area which has never been fully studied and which has gained new interest since the discovery of the paintings.

It is impossible to establish an association between the paintings and the engravings discovered in the past, as the style and chronology of the latter are not well defined. However, it may not be too risky to suggest a similar chronology for both groups of art, as they share certain artistic conventions, such as heads that are much smaller in proportion than the rest of the animals' bodies, and the simplified form of the figures, not without some naturalism.

The importance of this new discovery, apart from the intrinsic value of any discovery of Palaeolithic cave art, could be summarised, in this first appraisal, in the following points:

- It is a homogeneous and perhaps synchronic group which can be included in Leroi-Gourhan's style III, thus enlarging the geographical area containing caves with this kind of paintings, belonging to what has been called 'Group of the School of Ramales' (Apellániz 1982). This Group is formed by a limited number of sites, concentrated in time (Solutrean) and space (the area between the cave of Arenaza, in the Basque Country and, now, the Bay of Santander),

although the main sites are found around the town of Ramales de la Victoria, in the east of Cantabria.

- It displays some common artistic techniques in the central area of the Cantabrian region during the start of the late Ice Age, such as dots and colour-wash to represent animal figures, the convention in the representation of hinds' ears (V-shaped) etc.
- This frieze is the most important group of cave paintings known so far in the area around the Bay of Santander, a region of great importance during the Upper Palaeolithic, as is shown by the presence of sites such as El Juyo, El Mazo, Morín, Santián, La Llosa, Covalejos and El Pendo itself. All these caves have important stratigraphical sequences, documenting intensive human occupation during the Middle and Upper Palaeolithic. As has been said before, this is one of the areas with the greatest density of Palaeolithic sites, not only in the Cantabrian region, but in the entire south-west of Europe.
- The good state of preservation of the group (unaltered by graffiti or natural deposits) adds another element of interest. Only the lichen and dirt accumulated in cracks and hollows spoil their visibility.

This is therefore a new corpus of Palaeolithic cave art of exceptional interest and archaeological value, which should be studied in depth and which will doubtlessly provide interesting information about Stone Age art.

Acknowledgments

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Résumé. *Cet article présente un nouveau groupe d'art rupestre paléolithique découvert à Cueva de El Pendo (Cantabrie, Espagne). Cette découverte inclut 17 motifs peints en ocre rouge et en terre de Sienne et placés sur une frise de 8.8 m de long sur environ 3 m de haut. Les motifs sont homogènes en technique et en style et sont typiques des peintures cantabriques correspondant au style III de Leroi-Gourhan, par l'application de la technique du pointillage, et de conventions artistiques caractéristiques telles que les oreilles en forme de V dans la représentation des biches, l'animal le plus commun dans le groupe. Cette découverte augmente la répartition géographique du 'Groupe de l'École de Ramales', constitué de grottes telles que Arenaza, Covalanas ou La Pasiega, qui ont toutes de l'art très semblable à ce nouveau groupe de peintures à El Pendo.*

Zusammenfassung. *Dieser Artikel stellt eine neuentdeckte Gruppe paläolithischer Höhlenkunst aus der Cueva de El Pendo in der Region von Kantabrien, Spanien, vor. Der Neufund besteht aus 17 Motiven, gemalt in rotem Ocker und Siena auf einem Fries von 8.8 m Länge und 3 m Höhe. Die Figuren sind homogen in Ausführung und Stil, und sind typisch für die kantabrischen Malereien des Stil III von Leroi-Gourhan, durch die Verwendung von der Tüpfeltechnik sowie durch charakteristische künstlerische Konventionen wie die V-förmigen Ohren in den Darstellungen von Hirschkühen, den in der Gruppe häufigst vertretenen Tieren. Dieser Fund erweitert das Verbreitungsgebiet der sogenannten 'Gruppe der Ramales Schule', wie sie in Höhlen wie Arenaza, Covalanas oder La Pasiega vertreten ist, die alle Kunst enthalten, welche jener der neuen Gruppe von Malereien in El Pendo sehr ähnlich sind.*

Resumen. *En este artículo se presenta un nuevo conjunto de manifestaciones rupestres paleolíticas recientemente descubierto en la Cueva de El Pendo (Región Cantábrica, España). El hallazgo consiste en 17 figuras realizadas en colores ocres rojo y siena y ubicadas en un friso de 8.8 m de largo y 3 m de alto. Las figuras son homogéneas técnica y estilísticamente y se ajustan a los caracteres propios de los conjuntos cantábricos asignables al estilo III de Leroi-Gourhan, con presencia de la técnica del tamponado y convenciones tan características como las orejas en forma de V en las representaciones de las ciervas, el animal más representado en el conjunto. Este hallazgo, amplia la distribución del denominado 'Grupo de la Escuela de Ramales', compuesto por cavidades como Arenaza, Covalanas o La Pasiega, conjuntos con los que las nuevas manifestaciones de El Pendo presentan enormes similitudes.*

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KEYWORDS: *Petroglyphs - Bronze Age - Iron Age - Search survey - Norway*

SEARCHING FOR HIDDEN IMAGES: ROCK ART GEOGRAPHY IN STJØRDAL, TRØNDELAG, NORWAY

Kalle Sognnes and Anne Haug

Abstract. The spatial distribution of petroglyph panels in one of Scandinavia's largest concentrations of rock art is discussed. The Bronze Age/Early Iron Age rock art in Stjørdal, central Norway, was previously found to be non-random, with a strong tendency towards clustering. These clusters appear to have a rather regular distribution. Based on these two-level distribution patterns, hidden sites have been searched for by means of systematic field work. Panels found during this search, as well as panels accidentally found in recent years, were located at predictable locales, demonstrating the relevance and validity of the former observations.

Introduction

The Trøndelag district in central Norway is located at the western coast of the Scandinavian peninsula, between 62° 30' and 65° northern latitude. The main geographical feature is the Trondheim fjord, which reaches around 130 km inland. The central and inner parts of this fjord, however, run parallel with the coast (Figure 1). Several valleys lead from the fjord into large forests and mountain areas. Most of the present habitation is concentrated along the eastern side of the fjord and in the lower parts of the valleys, one of which is the almost 70 km long Stjørdal valley, that runs eastwards from the fjord to the border with Sweden. In this area one of Norway's largest rock art concentrations is found, the majority of petroglyphs being located in the Stjørdal municipality, that is, in the lower Stjørdal valley and at the Skatval promontory to the north-west of this valley.

Norwegian rock art has for almost a century been divided into two complexes or traditions. This dichotomy may be disputed (Hagen 1969; Helskog 1993; Sognnes 1992) but this question is not an issue in the present paper, which deals with the Southern Tradition (ST) or 'farmers'' rock art. Around one hundred and fifty panels with ST petroglyphs are known from Trøndelag. These petroglyphs consist of pounded and incised images on open-air panels. Motifs depict, above all, boats and footprints but also humans, animals ('horses') and some non-representational, mostly geometric designs. Cupules are frequent, too.

This kind of rock art is known from large parts of Scandinavia, demonstrating that common symbolic systems existed within this large area during the Bronze Age (1800-500 B.C.), to which the ST petroglyphs in general are dated. Dating this rock art is difficult, however, the general dating to the Bronze Age is supported by supposedly identifiable weapons depicted on the rocks and by engraved slabs in stone cists. The dominant motif, the boat or ship, was also depicted on bronzes, especially razors. Recent studies show that these bronze images were made during the entire Bronze Age, although the majority seems to belong to the Late Bronze Age, that is, 1000-500 B.C. (Kaul 1995). These images all depict one boat type, which is also the most frequent representational image, including in Trøndelag. This type has a second lower prow in the stem — a skid in addition to the usual construction (cf. Figure 5).

The dating problem is not an issue here, however, three other boat types are also represented, which hardly occur together with the Bronze Age type (Sognnes 1990: 80). These other types probably belong to other periods, one apparently earlier and two later than the Bronze Age (Sognnes 1987a: 86). This is in accordance with former claims that the making of ST rock art began in the Neolithic (Burenhult 1980; Fett and Fett 1941). For Trøndelag it has been claimed that this tradition lasted through to the Early Iron Age (Gjessing 1935; Marstrander 1974) and probably to the end of the Roman Period (A.D. 400) (Sognnes 1990: 75).

ST petroglyphs have been known from Trøndelag since the 1860s (Rygh 1873) but have mostly been published and discussed in short notes and reports (e.g. Marstrander 1970; Petersen 1926; Rygh 1908; cf. Sognnes 1991). Recently, however, this rock art has been more thoroughly studied (Grønnesby 1993; Marstrander and Sognnes 1998; Sognnes 1987a, 1987b, 1990, in prep.), but only a small part of the record has been published to date.

Landscape

Geologically Trøndelag is characterised by four main units, the majority of which consist of supracrustal rocks of

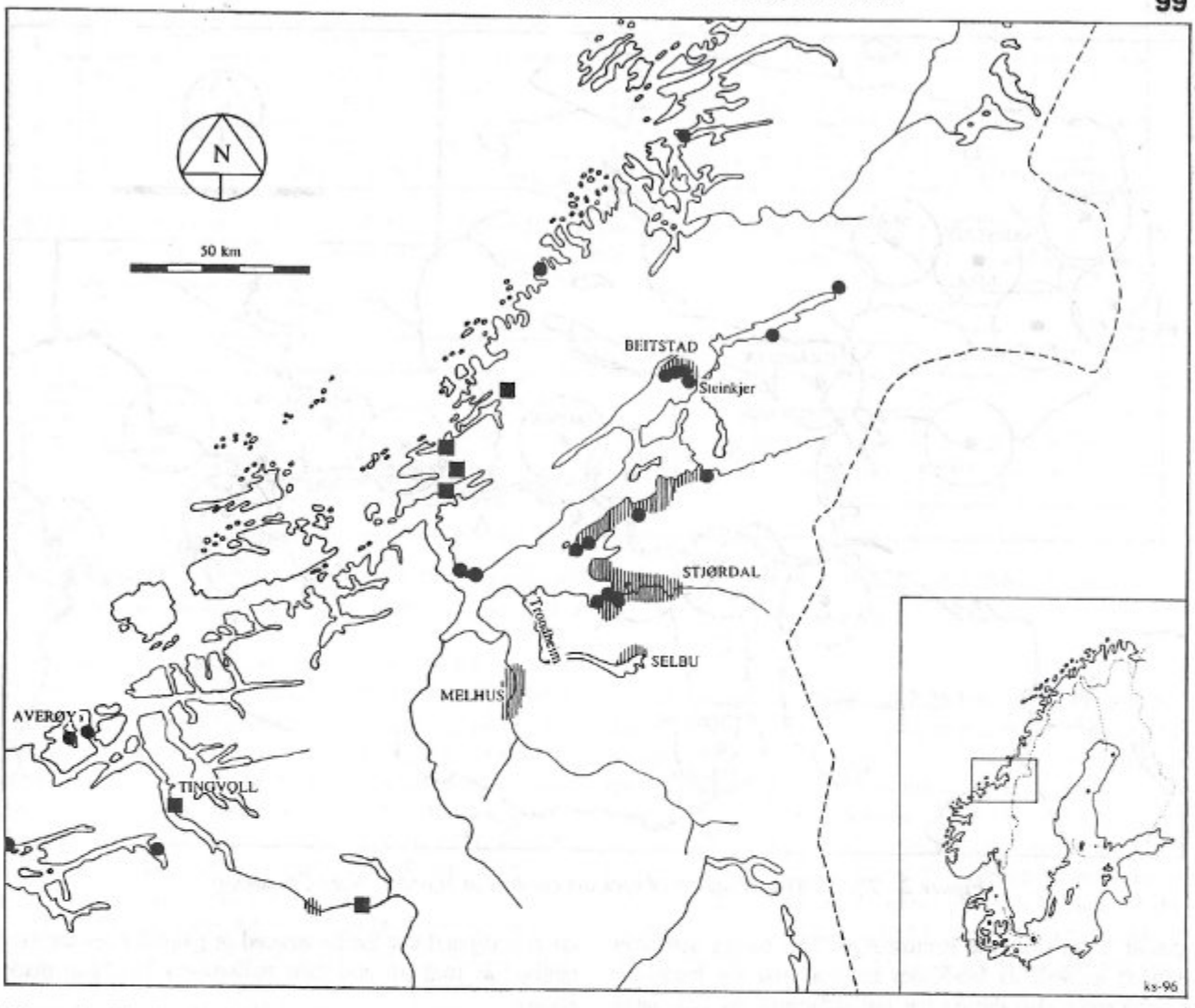

Figure 1. *The distribution of open air rock art in mid-Norway. Hatching represents areas where southern tradition petroglyphs are found. Circles represent petroglyphs, and squares rock paintings, belonging to the northern tradition.*

assumed Precambrian through Silurian age. These rocks are dominated by metasediments and igneous rocks of volcanic origin and are strongly folded and thrusted towards ESE in several nappes during the Caledonian orogenesis, forming a large anticline which is surrounded by Precambrian basement rocks that are found mostly in the coastal area but also along the Swedish border. At the coast molasse sediments of late Silurian and Devonian Age are known too. Caledonian plutonic rocks occur (Wolff 1979).

In the Stjørdal valley metasediments of Upper Ordovician age are found. Grey-green schists with intercalations of gneissic metagreywacke dominate. Most of the petroglyphs are executed on these rocks. Rocks of polymic conglomerate occur in the lower Stjørdal valley and on the Skatval promontory. Frequently this conglomerate delineates decorated panels. Samples from Leirfall, Ydstines and Hell have been analysed. The rocks are described as calcite-rich greywacke-sandstones consisting mainly of quartz, muscovite and calcite with a porous, calcite-free weathering zone (Prestvik 1981).

Scandinavia was covered by a large sheet of ice during the Late Pleistocene. When melting started, the ice rim in present-day Norway retreated eastwards, leaving behind what became the present land. However, this melting released enormous amounts of water into the ocean, resulting in a dramatic rise in sea level. At this time thick layers of marine clays were deposited in the Trondheim fjord basin. When desalinated, these clays may become unstable and landslides occur frequently. Numerous landslides, large and small, were, for instance, reported from Stjørdal during recent centuries (Evjemo 1993). Ice-rim deltas and later alluvial sand and gravel beds are deposited on top of the clays. At Skatval most of the arable land consists of clays, while most of the arable land in the Stjørdal valley consists of sand and gravel (Reite 1986).

Since the end of the Pleistocene the land has been lifted about 180 m, relative to absolute altitude, due to isostatic changes in the earth's crust. This means that rivers and creeks have continuously cut deeper into the original deposits, which have been eroded, further transported and redeposited, often several times, thus modifying the original Late Pleistocene/Early Holocene landscape (Sveian 1995).

The riverbed in the Stjørdal valley has been raised

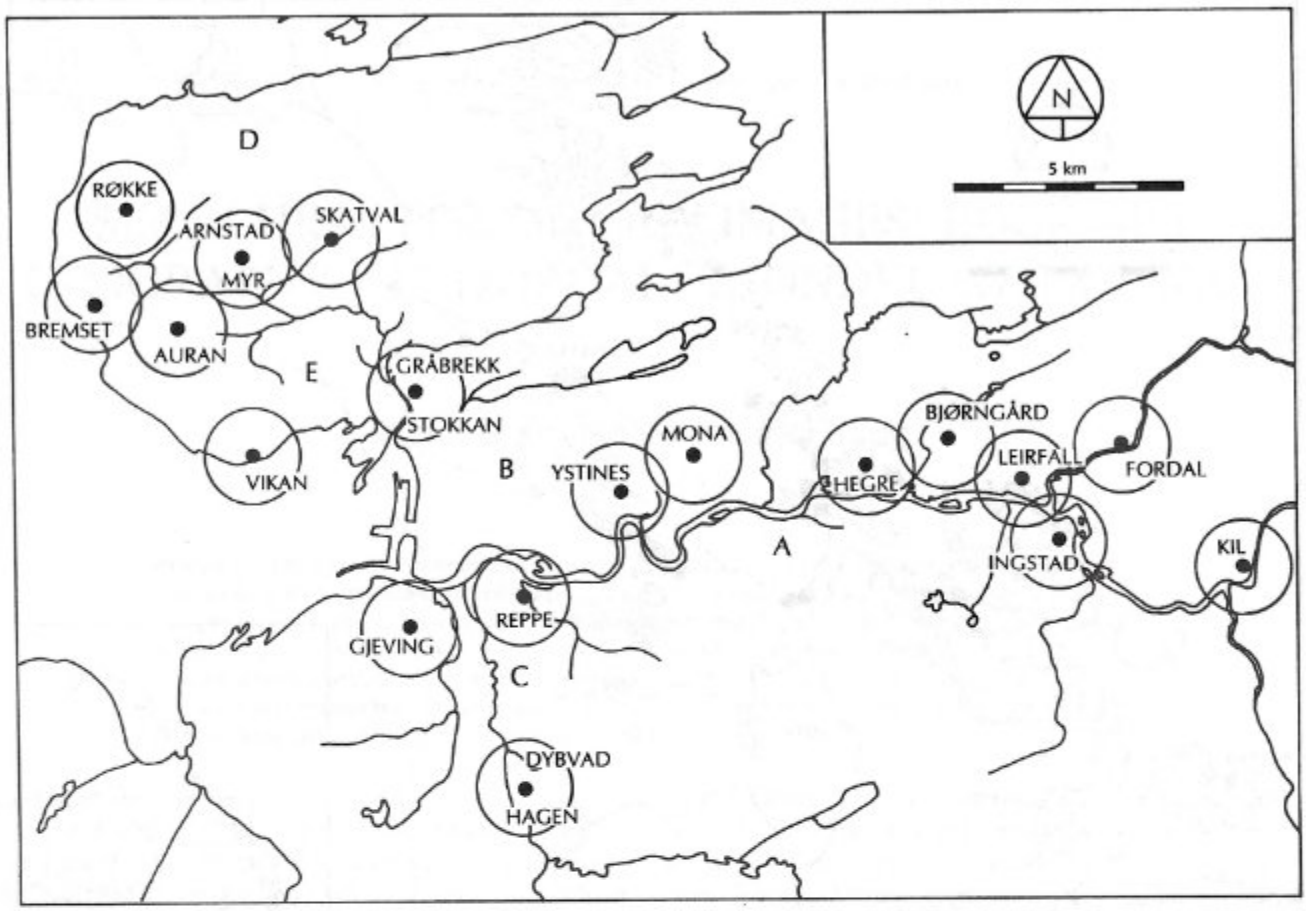

Figure 2. The 1980 distribution of rock art clusters in Stjørdal, Nord-Trøndelag.

almost 15 m since the Bronze Age. This means that river erosion as well as landslides have altered the landscape considerably also during the last millennia. In fact, large parts of the valley may be considered as an archaeological 'black hole' (cf. Groube 1981), in which no remains from Bronze Age and earlier periods, whether artefacts or settlement evidence, can be found (Sognnes 1983a: 20-5).

Petroglyph distribution

More than one hundred panels with ST petroglyphs are known in Stjørdal today, 76 of which were known before this study commenced in 1980 (Sognnes 1983a: 26-7). The distance from the westernmost panel at the farm Bremset to the easternmost at Kil is around 24 km as the crow flies. Most panels in the Stjørdal valley are found at the northern side. They occur, with some exceptions, at low altitudes at the transition between the cultivated alluvial terraces and the forested valley slopes. At Skatval the panels are mostly found at small hilltops and outcrops in the central part of the promontory.

The current distribution of rock art in an area depends on a number of factors (Sognnes 1989: 82): (1) that rocks suitable for pounding or painting were available; (2) that the former inhabitants produced rock art; (3) that this rock art has survived until today, not having been destroyed by nature or mankind; (4) that the rock art is visible today, and not covered by vegetation etc.; (5) that recent human activities have taken place in the area leading to their discovery; (6) and that the hammered or painted lines are recognised as rock art and their rediscovery has been made known.

During the Pleistocene the rocks in Trøndelag were polished by the ice, creating surfaces which were strongly resistant to most weathering processes. In general these polished surfaces still exist, although some minerals may be dissolved, and at almost every exposed rock, glacial striations can still be found. Parts of the rock surfaces may be destroyed due to weathering, but glaciation marks are still present at all panels where petroglyphs occur. At some panels the petroglyphs may be difficult to see under ordinary light conditions but rain and low afternoon sunshine enhance their visibility. Exfoliation occurs at many panels but has as yet only caused minor damage. Similar but undecorated rocks are also found outside the area where rock art is known.

The currently known distribution of rock art is clearly dependent upon the density of vegetation, frequently of dense coniferous forests, especially spruce (*Picea abies*), which migrated to this area as late as during the Iron Age (Hafsten 1992). Changes in farming during the last decades have led to a rapid change in vegetation near settlements. Grazing, especially by sheep and goats but also by cattle, traditionally kept shrubs and trees away. Today hardly any animals are grazing, resulting in increased forestation which has also led to an increased growth of lichen, moss and grass at formerly exposed rocks.

	Grids	Panels	Number of panels x	0	1	2	3	4	5	6	7	8
A	90	50	Grids observed n_{ex}	70	9	4	1	1	4	-	1	-
	90	50	Grids calculated n_{tx}	51.9	28.6	7.8	1.4	0.2	-	-	-	-
B	90	100	Grids calculated n_{tx}	29.7	32.9	18.3	6.8	1.9	0.4	-	-	-
	90	250	Grids calculated n_{tx}	5.6	15.6	21.6	20.0	13.9	7.7	3.6	1.4	0.5

Table 1. *The occurrence of petroglyph panels in Stjørdal compared with the Poisson distribution (the number of grids with 0-8 observed and calculated panels). A: the situation in 1980, when 50 panels were known. B: Expected values with 100 and 250 panels respectively.*

	1890	1920	1950	1980
Panels L	7	21	38	50
New panels L_n	7	14	17	12
Sites S	5	9	13	18
Average distance from nearest neighbour panel	2154 m	509 m	337 m	477 m
R_n	0.806	0.328	0.292	0.474

Table 2. *Number of rock art panels known from Stjørdal with 30-years intervals, average distances between nearest-neighbour panels and the result of nearest-neighbour analyses.*

Previous search strategies have influenced the distribution pattern of known petroglyphs. Once a panel has been found, people tended to look for more petroglyphs in the vicinity and they have frequently found at least one more panel nearby. However, the first discoveries at a particular place were made accidentally, by people not specifically looking for rock art. The current distribution thus appears to be more dependent on vegetation and human activity than on the occurrence of suitable rocks.

Measured distances between neighbouring petroglyph panels comprising representational images demonstrated that around 75% of the panels were situated less than 100 m from their nearest neighbouring panel (Figure 2). This non-random distribution was confirmed by a Poisson probability test. For this test the investigation area (the Skatval promontory and the cultivated lower part of the Stjørdal valley) was divided into 90 equal-area square grids with 1.5-km-long sides. The location of fifty-one panels could be plotted onto the maps, which gives an average of 0.55 panels per grid square.

A rather low correspondence was found between expected and observed values (Table 1). Whether the panels follow the Poisson distribution can be tested by a χ^2 test. Due to the low values all grids with three or more panels were treated as one entity. The result was $S = 20.24$ with two degrees of freedom. This value is so high that a H_0 hypothesis claiming that the panels are randomly distributed must be rejected.

A second test was based on a nearest-neighbour analysis. The formula used is $R_n = 2\overline{D}\sqrt{N/A}$, where $\overline{D}$ is the average distance from a panel to its nearest-neighbour panel, N the number of panels and A the investigated area. This test provides a mathematical expression for the dispersion, R_n, which may vary between 0 and 2.15. If the value is 1.0 the distribution is random, while the panels are regularly distributed if the value is 2.15, and all found within one cluster if the value is 0 (Toyne and Newby 1971: 116).

The investigation area was 2.25 km^2, while the average distance between nearest-neighbour panels was 477 m, the resulting $R_n = 0.474$ (Table 2). This can only be interpreted as a strong tendency towards clustering. Similar tests were conducted also for the years 1890 ($R_n = 0.806$), 1920 ($R_n = 0.328$) and 1950 ($R_n = 0.292$), in which the investigation area was kept constant. The clustering tendency is weaker in 1980 than in the previous years because of the recent discoveries of panels in Lånke parish to the south of the Stjørdal valley, where ST rock art was unknown until the 1950s.

The maximum distance between panels which belong to different clusters can be estimated to somewhere between around 600 and 1600 m (cf. Figure 2). The shortest distance between panels belonging to the clusters at Leirfall and Bjørngård/Smågård is 1050 m, and around 1000 m seems to be an acceptable distance for separating panels belonging to different clusters. We found that the Stjørdal rock art constituted eleven clusters together with seven isolated panels (Sognnes 1983a: 52). These eighteen entities are called 'sites' here.

Hypotheses

This distribution pattern demonstrates that the making of petroglyphs most probably was the result of a non-random use of the landscape. Panels found after 1980 have strengthened rather than weakened the hypothesis that the distribution is non-random. This means that if a ST panel is found in the Stjørdal area it most likely is accompanied by at least one more panel. At other rock art concentrations like Beitstad in Steinkjer, Nord-Trøndelag and Melhus, Sør-Trøndelag, we find glimpses of similar patterns. This observation, thus, could be a first starting hypothesis for any systematic search for hitherto unknown rock art panels in Trøndelag.

Also, the sites, when plotted onto a map (cf. Figure 2),

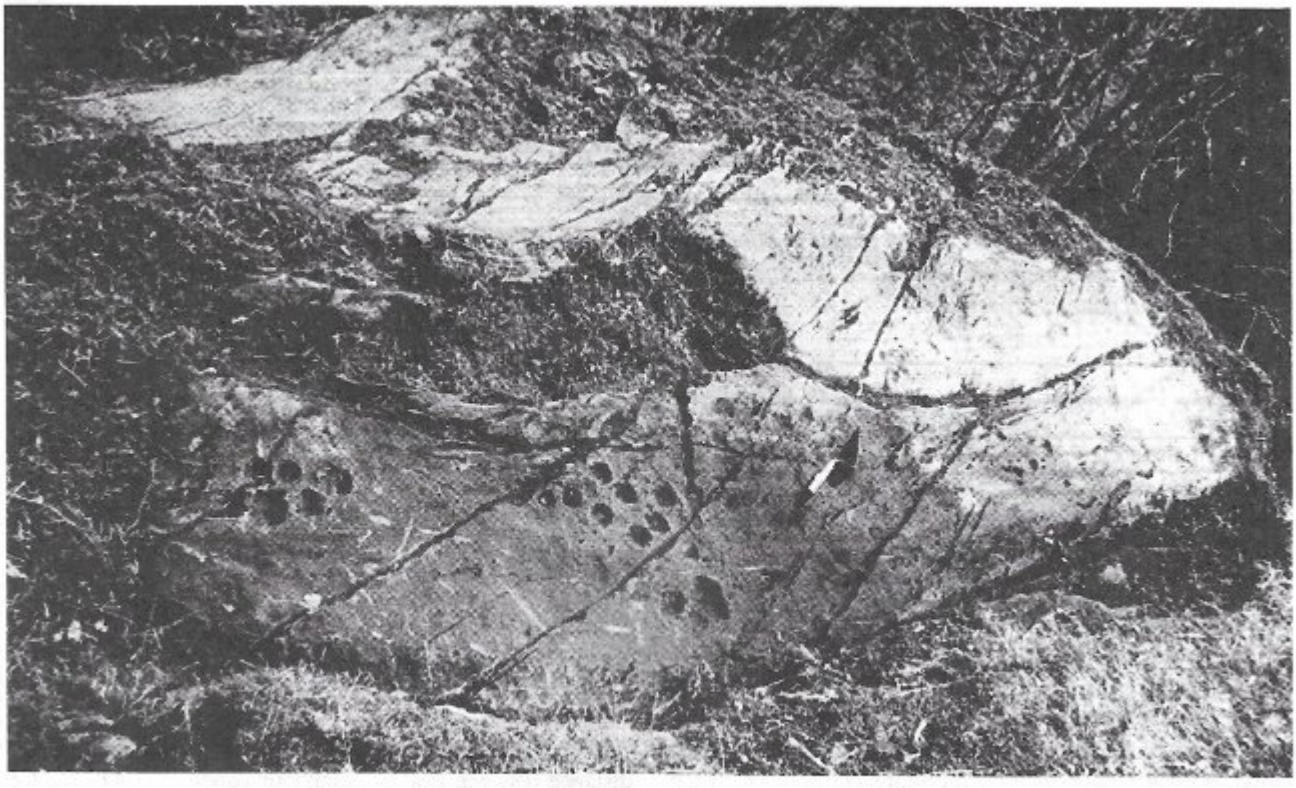

Figure 3. Cupules found at Hegge I (photograph by K. Sognnes).

appear to be rather regularly distributed, especially at the central Skatval promontory and in Hegra parish in the upper part of the valley. The distribution appears to be more random in the intermediate area although we find glimpses of the same pattern here also. A nearest-neighbour analysis gave $R_n = 1.40$, which hardly indicates any tendency towards a regular distribution; however, the number of likely sites is too low for this result to be significant. The average distance between nearest neighbouring sites was 2340 m, but in the two concentrations at Skatval and Hegra, the average distances were around 2000 m.

This pattern can be used as a second starting hypothesis for systematic search for rock art. If the rock art continues outside the area where it was known previously, we may predict that unknown hidden panels are likely to be found at a distance of about 2000 ± 500 m (which corresponds with ten out of eighteen measured distances) from any of the known sites.

The decorated panels have been studied and a trend has been demonstrated for preferred orientations and inclinations (Sognnes 1983a: 37-8). The median value for sloping directions is 170°; 50% of the measurements lie between 132° and 209°, 75% between 108° and 239°. The median value for the inclinations is 24°; 50% of these measurements lie between 16° and 33°, 80 between 11° and 43°. Thus, a third starting hypothesis is that unknown rock art panels in the Stjørdal area are likely to be facing south-east through south and sloping between 15° and 40°.

The ST rock art in general is associated with Bronze Age farming (Hultkrantz 1989; Marstrander 1963; Malmer 1989). In Trøndelag this period was apparently characterised by expanding farming communities and during the pre-Roman Iron Age (500-1 B.C.), agriculture became common around the Trondheim fjord (Hafsten 1987: 115). Thus it is most likely that the ST rock art in Stjørdal was made by sedentary farmers and the rock art distribution may mirror the contemporary settlement pattern. This implies that the petroglyph sites were associated with social units and their dwellings and territories, each social unit having its own petroglyph panels (Sognnes 1983a, 1993). Most likely these panels would be situated somewhere near the centre of each territory. If the rock art panels were randomly located within a territory, the overall distribution pattern also would be random, which, as demonstrated, is not the case.

A direct association between rock art and dwelling was demonstrated at Berg (Berri), when an outlying panel containing one boat image and some footprints was discovered under a narrow rockshelter which also contained habitation deposits. A test excavation revealed layers containing much charcoal but unfortunately no datable artefacts (Sognnes 1996). The bottom layer was dated to the transition between Bronze Age and Iron Age, 800-400 B.C. (2480 ± 130 bp uncalibrated; T-11161), at a time one would expect a boat image of the type found (with prow and skid in both ends, similar to the pre-Roman Period Hjortspring boat found in Denmark) to have been made. The uppermost layer was dated to A.D. 1000-1200 (950 ± 105 bp uncalibrated; T-11160), which corresponds with incisions (crosses etc.) of supposed Medieval origin.

More than 4500 petroglyphs are known from Stjørdal, of which around 2000 can be classified as representational while more than 2500 are cupules. The number of images vary between the four Stjørdal parishes. Hegra and Skatval

dominate; the majority of the cupules, however, are found in Skatval.

All motifs are known from and occur frequently in the Southern Tradition all over Scandinavia. Boats and footprints dominate and to some extent one may find a dichotomy between these two motifs. However, at most sites, especially the larger ones, they occur together and Leirfall is a major site for all sub-traditions, except cupules. At some small panels and sites only cupules, boats or footprints, occasionally also 'horses', are found. While footprints and boats occur at all larger central sites, 'horses' in general have a more peripheral distribution. Yet a claim that the distribution of the sites mirrors different rock art sub-traditions representing several social sub-groups can hardly be sustained. This, however, does not imply that such subgroups did not exist. If they existed, they in general shared the same sites for their petroglyphs.

Search areas

Searching for hidden rock art in the Stjørdal area is difficult due to dense vegetation of trees and shrubs, or grass, moss and lichen. Even after weeks of intensive labour with negative results, rock art may still evade detection, as demonstrated by the panels Bjørngård XIII and XIV, which were described and photographed by K. Rygh almost a century ago (1914) but have not been located during later investigations, when several other panels were found.

Five areas which in 1980 were without petroglyphs should be of special interest for further survey; the southern side of the Stjørdal valley between Reppe and Ingstad (A on Figure 2), the northern side of the valley between Gråbrekk/Stokkan and Ystines (B), the lower part of the Leksdal tributary valley between Reppe and Hagen (C), the northern part of the Skatval promontory to the north of Røkke, Arnstad, and Skatval (D), and the south-eastern central part of this promontory, between Vikan, Auran, Arnstad, Skatval and Gråbrekk/Stokkan (E).

According to unconfirmed reports, petroglyphs exist at the farms Hembre and Øfsti at the south side of the Stjørdal valley (area A). The first attempt to test these hypotheses by means of systematic field-walking took place at the northern part of the Skatval promontory in 1985. Based on the distances from the sites Røkke, Arnstad and Skatval, petroglyphs were searched for at the southern side of the Heggesberget hilltop, which dominates the northern part of the promontory (area D). Two small panels with cupules were found at Hegge (Figure 3).

In 1990, petroglyphs were found at Stuberg in the lower part of the Leksdal valley, half-way between Reppe and Hagen (area C). This Stuberg I panel is located at the vertical south-western side of a small hilltop. Only boats are depicted (Figure 4, see front cover). The type represented is supposed to be late, most likely from the Roman Period, i.e. A.D. 1-400 (Sognnes 1990, 1991). However, one of the images probably depicts a sailing vessel, which was not introduced in Scandinavia until the second half of the first millennium A.D. (Christensen 1985: 51-2).

This panel is so far unique in Scandinavia and its relevance for this study was uncertain, but in 1997 the panel

Figure 5. Tracing of the lower part of Stuberg IV. (Note: Figure 4 is located on the front cover of this issue.)

Stuberg IV (Stuberg II and III contain only recent graffiti) was found near the crest of the same hilltop. This panel has a more standard repertoire with depictions of boats of Bronze Age type, footprints and anthropomorphs together with cupules (Figure 5).

In 1996, the Museum of Natural History and Archaeology (*Vitenskapsmuseet*) at the Norwegian University of Science and Technology (NTNU) sponsored a searching campaign in Stjørdal. The area at the northern side of the lower Stjørdal valley (area B) was chosen. Several arguments were in favour of this choice. Fist, because of the distances from already known rock art sites which gave room for one possible hidden site. Second, because charcoal found in plough furrows found underneath the presently cultivated soil at Husby, which is located in this area, have been dated to the pre-Roman Iron Age, that is, 200 B.C. - A.D. 10 (2080 ± 80 bp uncalibrated; T-3505) (Farbregd 1980), demonstrating that the area was cultivated and likely settled at a time when petroglyphs arguably were still being made. Third, because several of the farms in this area have names (i.e. Re, By and Berg) which indicate that they may be of Early Iron Age origin (Stemshaug 1973).

Survey method and results

The search area followed the hill base from Stokkan in the west to By in the east, a distance of about 4000 m. It can be divided into three parts (Figure 6). The western part has low relief and is dominated by cultivated land belong-

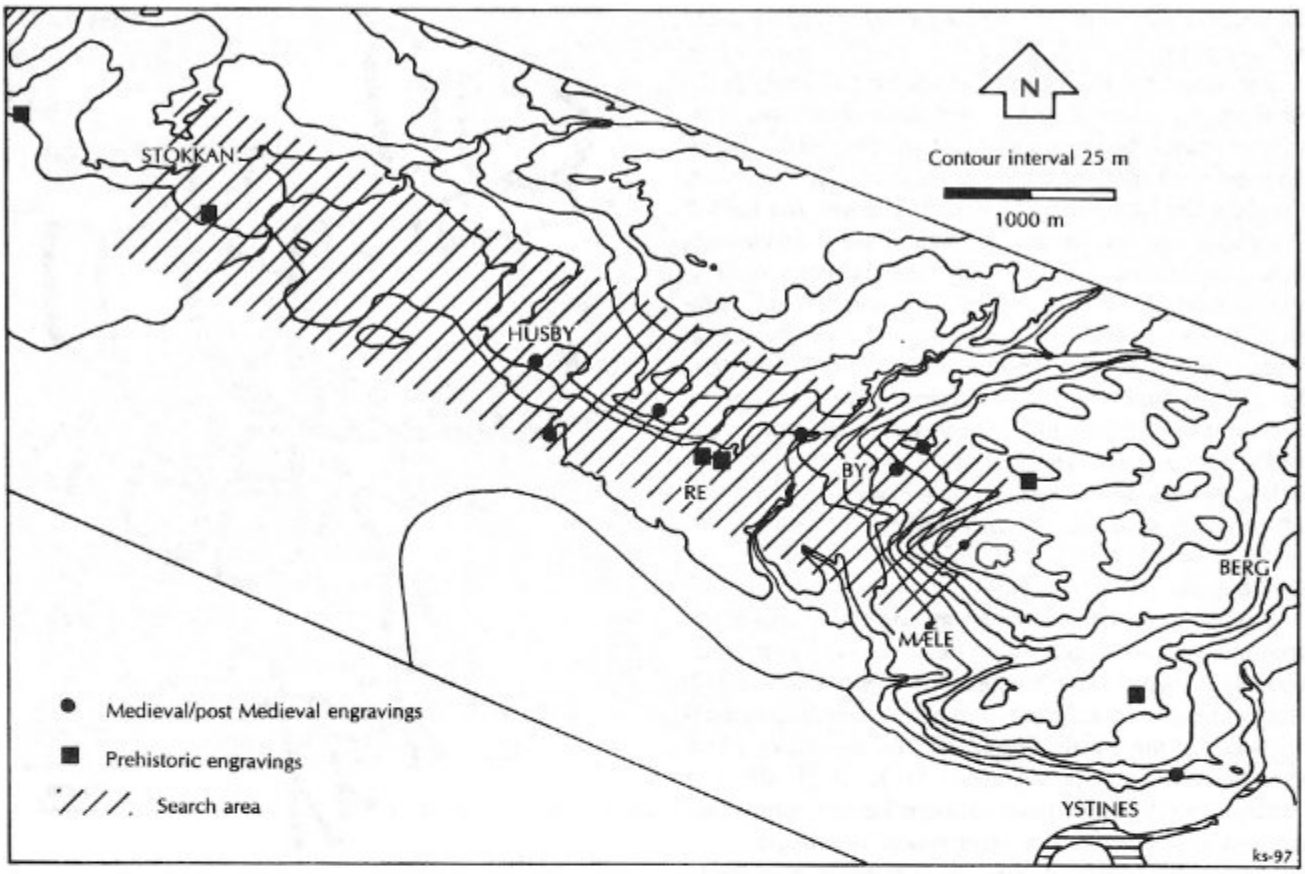

Figure 6. Map of the area between Stokkan and Berg at the northern side of the Stjørdal valley, indicating search areas and sites described in the text.

ing to Stokkan and Husby, which are separated by the Stokkanbekken creek. At Stokkan, petroglyphs have been known since the early 1920s, being part of the Gråbrekk/ Stokkan site, where depictions of boats, animals, footprints and concentric rings are found (Sognnes 1983b). Most of this western part lies today in the outskirts of the Stjørdal township. Searching in numerous urban gardens was deemed futile.

To the east of the search area, petroglyphs are found at Ystines. The location of this site is unusual, high above the valley floor at a large promontory which is crossed by several old paths. The rather steep and densely forested western slopes belong to the farms By and Mæle. The most prominent path passes a few metres from the Ystines panels, which constitute one of the larges sites in Stjørdal. Cupules are especially frequent; other motifs represented are boats, footprints, anthropomorphs and rings (Sognnes 1983b). A less significant path to the north of the hill Koksåsen passes the Berg I panel in the narrow Singeldalen valley.

The search was concentrated at the northern side of the lower part of this valley. Some recent engraved letters and numbers were found. Few exposed rocks were observed, most of which were rather badly preserved, consisting of conglomerate or highly schistose sandstones. In the lower part some outcrops have been blasted during road construction.

Already from the onset of the search, the central part was deemed to be the most promising, but a basic rule was that the entire area should be dealt with in the same way; all exposed outcrops should be surveyed. In this central part, the Rehamran cliffs rise almost vertically to the height of about 70 m above the river plain. Both the hill base and the plateau on top of these cliffs were searched. At the top some recent engravings were found. The rocks in this area consist mainly of coarse conglomerate. Parts of the Rehamran cliffs are also highly schistose.

In front of the eastern end of these cliffs some low outcrops are situated, on two of which petroglyphs were found. The decorated panels were not facing south as expected. This is probably due to the fact that the southern parts of the outcrops consist of conglomerate, while the northern sides have fairly smooth surfaces; also, the panels are much steeper than usually.

The investigation took place during the first half of August under good weather conditions. Thus the search party, which was led by Anne Haug (1996), could experience the changing pattern of lights and shadows caused by the sun. The panels are strongly weathered, and the petroglyphs are hardly visible under normal light conditions. However, around 10 a.m. the sun started shining on the panels at low angle to the surface, rendering all images clearly visible (Figure 7, see back cover). As the sun climbed higher, the images disappeared before they once again became visible around 2 p.m. During most of the year the sun is too low for this to happen.

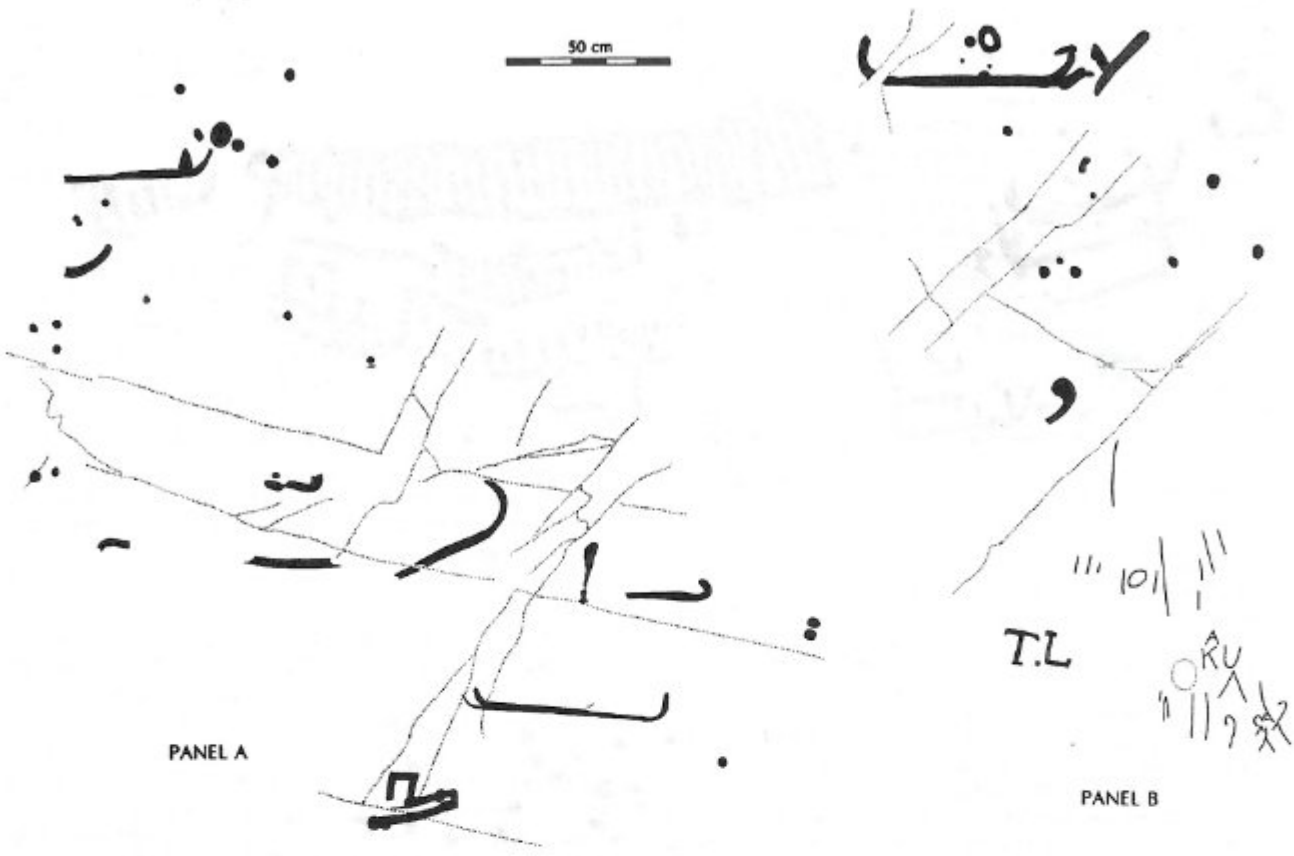

Figure 8. Tracing of Re I. (Note: Figure 7 is located on the back cover of this issue.)

Unlike the Stuberg panels, which both contain unique images, the Re panels are quite ordinary. The easternmost panel, Re I, is found at a dome-shaped outcrop which is almost 4 m high. The images occur all over the panel (Figure 8). Most of them appear to be incomplete. Numerous small cupules are found together with eight possible boats, which were drawn by single lines; only one image is complete, depicting the Bronze Age type of vessel.

Re II was found some 100 m west of Re I. The setting is the same but this outcrop is only about 2.5 m high. The lower part is dominated by small cupules but in the upper part, simple single-lined boat images appear, of which some have short vertical lines which traditionally have been interpreted as indicating crew members. Most of these images depict the Bronze Age boat type. At the upper edge of the panel, where it is first reached by the sun, is a more than 1-m-long, rectilinear figure consisting of two parallel horizontal lines between which are found short parallel vertical ones. Most likely this image also depicts a boat.

Conclusions

Trøndelag was apparently occupied by Europe's northernmost permanent Bronze Age community, as evidenced from artefacts — that is, bronzes, stone axes, flint daggers etc. Some finds come from graves and some from hoards but the majority are stray finds (Gaustad 1965). To this should be added numerous grave monuments (cairns) and petroglyphs. It has been claimed that this was no Bronze Age proper (Marstrander 1954: 67), since most artefacts were still made from flint and local rocks. Farming has, however, been considered the basic subsistence, especially along the Trondheim fjord, where one of Norway's largest concentrations of Bronze Age cairns is found (Rygh 1906; cf. Hagen 1983: 199-200).

The rock art found in this district constitutes one of the largest concentrations in Scandinavia. Also, at the regional level the rock art distribution is non-random, being allocated to Stjørdal, and to a minor extent to Steinkjer (Beitstad parish) in Nord-Trøndelag and Melhus and Selbu in Sør-Trøndelag. Although the archaeological artefacts found are clearly outnumbered by the rock art panels, they have a wider distribution. Thus the making of petroglyphs apparently took place within a small part of the Trøndelag Bronze Age community. Stjørdal, with its abundance of petroglyphs, grave monuments and numerous stray finds apparently acted as the major stronghold of the local version of the Scandinavian Bronze Age culture. Apparently the making of rock art was primarily restricted to this centre. Within it, however, access to the rock art and its meaning seems to have been rather democratic, allowing a number of socio-economic entities at household or family level to have their own engraved panels (Sognnes in prep).

Since 1980, the number of known rock art panels has increased by around 20%. Many of the 'new' panels were found within already known sites, but some new sites have also been found. The number of sites, thus, has increased to twenty and at the same time the number of sites with only one panel was reduced to three. A nearest-neighbour

Figure 9. Tracing of Re II.

analysis based on the 1997 record gave $R_n = 0.218$, which represents the strongest tendency towards clustering ever.

In addition to these sites, the last two decades have also revealed the existence of some outlying panels, mostly with cupules only, between the sites — Berg I being one example. These outliers may be interpreted as a kind of border markers between sites. Interestingly, Berg I is situated around 50 m from the present border between the farms By and Berg, which both may be of Early Iron Age origin.

The sites at Stuberg and Re both have more than one panel and are located in areas that previously lacked known sites, a little less than 2000 m from previously recorded sites. Yet a nearest-neighbour analysis based on the sites gave the same result as the 1980 analysis. Images of two different types of boats are found at Stuberg, perhaps of the Bronze Age and Roman Period Iron Age. Pre-Roman Iron Age images have not been recorded, and it is tempting to predict that at least one more panel exists at this farm.

The search for and discoveries of petroglyphs in the Stjørdal area has confirmed the relevance of the hypotheses which were based on the 1980-distribution. It is possible to predict the location of hidden rock art sites and, when a site is discovered, it will consist of more than one panel.

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Résumé. *On discute la répartition spatiale des panneaux engravés à une des plus grandes concentrations d'art rupestre en Scandinavie. Il a déjà été établi que l'art rupestre de l'Age du Bronze/l'Age du Fer primitif à Stjørdal, Norvège centrale, n'est pas distribué au hasard, ayant une forte tendance à se grouper. Ces groupes semblent avoir une répartition plutôt régulière. Basé sur ces formules de répartition à deux niveaux, on a cherché des sites cachés en conduisant une enquête systématique sur le terrain. Les panneaux découverts durant cette enquête, ainsi que les panneaux trouvés fortuitement dans les années récentes, étaient situés dans des endroits prévisibles, ce qui démontre la pertinence et la validité de l'observation préalable.*

Zusammenfassung. *Die räumliche Verteilung der Petroglyphen Tafeln in einer der größten Konzentrationen von Felskunst in Skandinavien wird erörtert. Die bronzezeitliche/früheisenzeitliche Felskunst in Stjørdal, Mittelnorwegen, ist bereits zuvor als nichtzufällig verteilt erkannt worden, mit einer deutlichen Tendenz zur Ballung. Diese Ansammlungen scheinen eine eher regelmäßige Distribution zu haben. Auf Grund dieser zweifachen Ebenen von Verteilungs-Modellen wurde mittels systematischer Feldarbeit nach versteckt gebliebenen Fundorten gesucht. Tafeln von Petroglyphen, die während solcher Suchen gefunden wurden, ebenso wie in den letzten Jahren zufällig gefundene Tafeln, fanden sich in voraussagbaren Lokalitäten, was die Sachdienlichkeit und Gültigkeit der vorigen Beobachtungen bestätigt.*

Resumen. *La distribución espacial de paneles de petroglifos en una de las mayores concentraciones de arte rupestre en Escandinavia es discutida. Anteriormente se descubrió que el arte rupestre de la Edad del Bronce/Edad Temprana del Hierro en Stjørdal, Noruega central, no fue hecha al azar, y tenía una fuerte tendencia hacia la agrupación. Estos grupos parecen tener una distribución bastante regular. Basado en estos dos modelos de niveles de distribución, se buscaron sitios ocultos por medio de un trabajo de campo sistemático. Paneles encontrados durante esta búsqueda, así como paneles encontrados accidentalmente en años recientes, fueron localizados en áreas predecibles, demostrando la relevancia y validez de observaciones anteriores.*

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THE IMPACT OF FOSSILS ON THE DEVELOPMENT OF VISUAL REPRESENTATION

John Feliks

Abstract. The origins of visual representation have been debated primarily in terms of human activity and psychology. This paper proposes that man-made representation was preceded by a natural, already quite perfected representational system, the products of which were observed and collected by early humans. The author suggests the following new hypotheses: (1) Fossils were a means by which human beings came to understand the concepts of 'imagery' and 'substitution' *prior* to the creation of man-made images. (2) Humans evolved their own forms of iconic visual representation (especially those in the medium of rock), having first been made aware of various possibilities via fossils. (3) Many unexplained pre-Historic artworks may be structurally and proportionally accurate depictions of fossils. Because fossils are known throughout the world, the hypotheses have cross-cultural validity. Clinical studies offer the potential of analogical testability.

Introduction

Based on discoveries made in a Mousterian occupation layer, Leroi-Gourhan suggested that the collecting of fossils by Neanderthal people represented early evidence of an order of thought which transcended the everyday needs of survival (1964: 75). He also interpreted this collecting of fossils as one activity which might be seen as a distant introduction to figurative art (1964: 69).

A decade or so later, Oakley began bringing attention to Acheulian period artefacts which contained embedded within them large fossils in central positioning. The central positioning of these fossils was the result of careful knapping by the makers of the implements as much as 250 000 years ago (Oakley 1971, 1973, 1981, 1985). Hence, these artefacts indicated not only that fossils had been collected at that remote time in human pre-History, but also that they had received special treatment. Oakley considered such fossil-ornamented stone tools as important markers in the emergence of 'higher thought' (1981).

The idea that an awareness of fossils might reflect developments in human cognition has re-emerged in the present decade. White, for instance, considers the collecting of fossils by Neanderthal people as one activity showing the 'glimmerings of symbolic representation' (1993b: 61). He has also demonstrated that some of the earliest personal ornaments showing *complex* methods of production were made from fossils (1992, 1993a). Marshack (1991b: 57) suggests that the collecting and curation of stones and exotics may have been 'precursive to later depictive traditions'. Taborin (1993b: 211) views the collecting of fossils by pre-Aurignacian people as a possible stage 'prior to the elaboration of true socio-cultural systems'. According to Taborin, shells [including fossil shells] represent one of the constituent elements in the 'externalisation of ideas' (1993b: 212).

In this work, I will offer perspectives which support those of Leroi-Gourhan, Oakley, White, Marshack, and Taborin. However, I will approach the subject from a different direction; I will consider the act of fossil collecting by prehistoric people not only as a *sign* of higher intelligence, but also as an *influence* on such intelligence. I will discuss ways in which the mentality and creativity of early people may have been affected by the observation and collecting of fossils in prehistoric times.

The paper begins with fossil-based theories on what preceded the first man-made representations, collectively termed the 'natural representations theory'. What distinguishes this theory from others in the origins of representation debate is that it does not treat visual representation as a human *invention*, but rather as a human *imitation* of a pre-existing natural phenomenon already quite perfected and variably developed. I propose that the human concept of 'image' as iconic representation containable in solid mediums was a development *primed* by a critical cognitive realisation imparted by fossils.

In Part II, I offer developmental chronologies elucidating the potential of fossils as stimuli in the transition from 'natural' to 'artificial' representation. Here, I propose that humans evolved their own forms of visual representation after having first been made aware of various possibilities via fossils. The many similarities between

fossils and 'rock art' are explored.

In Part III, the 'fossil depictions theory' is presented. Here, I discuss the possible representational base for seemingly non-representational Upper Palaeolithic artworks. In addition, I suggest an alternative explanation for the representational base of certain Neolithic–Bronze Age 'schematic' artworks. I offer several comparisons of each of these with possible fossil referents. In many cases, the fossil taxa provided as referents are known from the very regions in which the rock artworks were created.

Before moving on to the body of the text, I wish to make two clarifications. Firstly, I will not be discussing the physical technologies of depiction, how they evolved, or the cognitive processes by which they were applied to depiction; these issues I leave to others. Secondly, I emphasise that I am not positing an all-encompassing theory, but rather, just one logical and very plausible perspective which should be explored for the sake of good science. Like Davis (1986b: 515), I believe that 'image making' by human beings probably had many 'unrelated' origins. Indeed, the 'archaeological record' *as we know it* indicates that image making began and ended again and again in many different geographic locations. From this perspective, I envision that the last word on the origins of depiction will lend validity to all reasonable theories, as well as demonstrate compatibilities and potential interactions between theories.

This paper is a broad, interdisciplinary, secondary analysis of the present data. Although theoretical, I believe that the perspectives presented herein warrant consideration by anyone sincerely seeking to understand the mentality of our prehistoric ancestors. If this paper succeeds in stimulating serious discussion on the subjects treated, regional investigations, clinical testing and new insights into 'abstract signs' then it will have fulfilled its purpose.

PART I

PRIMING THE DEPICTIVE MIND: AWARENESS OF FOSSILS AS PRECURSOR TO DEPICTION

The 'natural representations theory'

Understanding imagery without creating imagery

The making of iconic visual representations is one of the most significant differences between human beings and all other living creatures. There is no evidence that any other animal species has ever invented such a device. Although some animals such as chimpanzees have learned to *use* representation, this has only been through human teaching (see Russon et al. Parker 1996; Gould and Gould 1994; Donald 1991; Roitblat 1987 for overviews and references). But herein lies a conundrum; modern human beings, themselves, are also *taught* representation; they never 'invent' it on their own.

How, then, did mankind attain to an initial understanding of representation without the benefit of a teacher? A chronological distinction provides one possible answer: humans do not first learn representation by creating their own representations, but, rather, through exposure to *already-made representations*. Mere exposure to representations (e.g. Hochberg and Brooks 1962; Dirks and Gibson 1977) seems sufficient to teach human children that images of living things can exist in non-living materials. This is not something they innately know, but something they learn through exposure. By analogy, if, in the natural world of prehistoric people, there were *images* for which there could have been no doubt as to the identity of their living referents, then the concepts of icon and referent could have been learned via simple observation of the natural world.

Natural representations

The earth contains abundant, ready-made examples of what are, for all practical purposes, complete representations — fossils. Fossils 'represent' animals and plants which were once alive and may also be said to represent similar animals and plants which are still alive. Fossil invertebrates and plants are even more complete and accurate as representations than are the modern representations in photographs. I state this for three reasons: (1) Many fossils have the same three-dimensional quality as their living counterparts. (2) Fossils are often the same size as their living counterparts. (3) Many fossils contain so much intricate detail as to be virtual replicas of the living forms themselves, albeit, in a different *natural media*. It is this very fact that fossils exist in 'different media' than living forms that makes them 'representations' rather than undifferentiated examples of living forms.

That modern people trained in representation perceive fossils as representations is exemplified by terms such as 'self-illustrating phenomena' (Robin 1992: 130). Other evidence that the representational nature of fossils is fully accepted in modern society includes such long-used phrases as 'pictures in the rocks,' or 'stories told by stone'. This modern view of fossils is significant, in that it forces us to consider, retrospectively, what effect fossils may have had on the prehistoric mind, as yet uninitiated in representational thinking.

Three levels of reality in one moment

> The sense produced by symbolism is not the conscious sense of reason but the more subtle sense of unconscious association between things that are somehow assumed to be like. (Foster 1990: 536)

It is not uncommon to find living ferns growing right out of the ground which contains fossils of their ancient predecessors. In fact, when studying fossil ferns at many locations, shadows from the living ferns are cast upon the rocks, and may be mistaken for the very fossils one is seeking. In observing living ferns, fossil ferns and shadow ferns side-by-side, ancient man would have sensed a connection between them. He probably would have realised that all three are ferns, though one is soft and pliable; another, hard and inflexible; and yet another, clearly visible, though physically intangible. The critical point is that all three could easily be viewed si-

multaneously, thus encouraging association. By such experience, the mind of early man could have been opened to the *possibility* of symbolic representation (Fig. 1)[1].

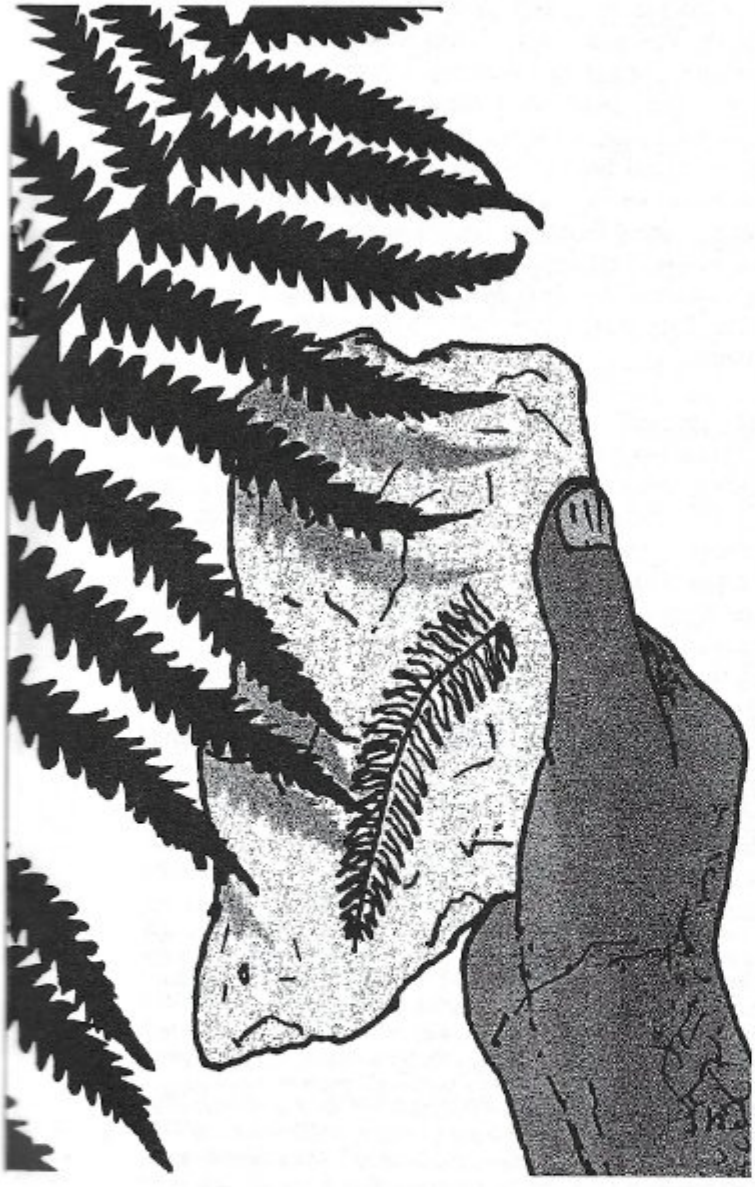


Figure 1. *Living fern, fossil fern and fern shadow observed simultaneously.*

Ferns (and other plants with pinnate leaf patterns) have long been common around the world. That Palaeolithic people observed such plants is demonstrated by archaeological evidence dating as far back as the Acheulian. At the site of Stoke Newington, England, for instance, there were found abundant samples of the ferns *Osmunda regalis* ('Royal Fern') and *Aspidium Filix-mas* which had been collected by the site's inhabitants (Smith 1894: 288-92; Keeley 1980: 164). Fern fossils are as common as living ferns in some places. They have long been known from England (e.g. Phillips 1871). In France, fern fossils are found not far from Aurignacian sites containing early representational art (Abrard 1948; Fenelon 1951; Debelmas 1974; Feyes 1975; Autran and Peterlongo 1980). The proposed fern/fossil experience may be echoed in the fact that a few prehistoric cave paintings, antler engravings etc., in France and Spain appear to represent plants with fernlike leaf patterns (Marshack 1991a: 170–99; Bahn 1997: 156).

Well-preserved fossil ferns as well as living ferns are also known in many parts of another early art region, Australia (Laseron 1969; Whitehouse 1948). White (1990) provides photographs of Australian fern and other plant fossils which are so remarkable as to resemble paintings. That the Aborigines observed such fossils may be echoed in myths relating that animals and plants were 'painted' on rock surfaces in primeval times (e.g. Lommel 1967: 146).

Iconic recognition

I suggest that the moment a prehistoric person first observed *any* well-preserved invertebrate, plant or fish fossil, he would have grasped the obvious visual association between the fossil and its familiar living counterpart. In other words, he would have had the most basic experience of noticing absolute similarity between two physical objects in two completely different media of nature. By comparing the fossils he saw in rock with living forms, early man would have learned the same lesson that modern children learn when exposed to photographs — iconic images of living things can exist in non-living materials.

Credit to Palaeolithic people for recognising the iconic nature of fossils cannot be withheld if we accept that an oddly-shaped stone artefact from Berekhat Ram, Israel, was comprehensible as a 'human figure' to Acheulians (see Goren-Inbar and Peltz 1995; Marshack 1997 etc.). When compared with the iconic accuracy of fossils, this 'figurine' looks very little like a human being. A similar comparison is made with the naturally-formed Makapansgat cobble thought to have been recognisable as a 'face' to australopithecines (see Oakley 1981; Bahn 1997, 1998; Bednarik 1998). If these two quite unique stone objects are accepted as iconic images recognisable by *Homo erectus* (or archaic *Homo sapiens*) and *Australopithecus*, then it must be admitted that abundant stone objects which are virtual replicas of living forms (fossil shells, ferns etc.) would certainly have been recognisable by the same hominids as iconic images. In this light, I suggest that prior awareness of the iconic nature of fossils primed the capacity for 'mental projection' of human forms into oddly shaped stones.

Palaeo-cognitive and ethnographic analogy

Potential clinical testing of the 'natural representations theory'

Because chimpanzees are, biologically, our closest of kin, results of cognitive testing with chimpanzees have long been used to infer ideas about our own ancient

[1] For more on shadows and the origins of representation see Oakley 1964: 129-30; Carrier 1984, 1986. For more on ambiguity of perception and the origins of representation see Davis 1986, 1987; Bednarik 1994a: 42.

ancestors' cognitive abilities. Such testing offers valid analogies for understanding the beginnings of iconic recognition, signs of which are believed by many to date as far back as the Acheulian and possibly earlier.

Clinical studies indicate that chimpanzees can recognise iconic images depicted in photographs and well-defined line drawings (e.g. Gardner and Gardner 1969; Davenport and Rogers 1971; Itakura 1994). But since these forms of representation were non-existent in Lower Palaeolithic times, analogous connections to the earliest iconic recognition are tenuous. However, if similar studies are conducted using fossils, persuasive connections are possible because fossils are iconic images known for certain to have been *seen and handled* by Lower Palaeolithic humans.

I predict that in test situations, chimpanzees will more readily associate well-preserved fossils (e.g. shells, ferns) with living forms than they will either line drawings or black and white photographs of the same because the resemblance is greater (see Premack 1976; Brown 1981). From positive results, it might easily be inferred that the more intelligent archaic *Homo sapiens*, *Homo erectus*, and possibly earlier hominids, could have recognised fossils as 'representations' of living forms rather than mere 'interesting patterns' or 'curious objects', as popular notions tend to imply. This would support the proposed chronology that human beings developed their own forms of image-making after exposure to 'natural imagery'.[2]

Indigenous myths suggesting an awareness of natural representation

Every human culture must find some way to explain the enigma of naturally-occurring plant and animal images in stone.[3] In 'pre-scientific' cultures, explanations for fossils would likely entail the creation of myths. Fossils might easily inspire mythologies of design, creation, birth, death and spirit world. Later, due to the shared medium of rock, such myths might also be applied to man-made images on rock surfaces. By analogy, certain myths of modern indigenous cultures may represent a link to prehistoric ideas concerning fossil imagery on rock surfaces (consider Marshack 1991b: 57).

Myths surrounding Australian Aboriginal paintings of various 'Ancestral Beings' seem to reflect an awareness of pre-existing iconic images on rock surfaces (e.g. Crawford 1968; Mowaljarlai 1992; Walsh 1992; Flood et al. 1992). Many accounts deny human involvement while seeming to describe quite well the process by which organisms are transformed into fossils. For instance, certain ancestral beings are said to have laid down here and there 'while the rocks were still wet' and eventually 'sank into the earth, leaving impressions behind that remain today as rock paintings' (Campbell 1988: 141).

Also suggestive of fossils are myths relating that ancestral beings simply 'turned to stone' in primeval times (e.g. Fullagar et al. 1996: 754) and that they are 'embedded in the rock for all eternity' (Arden 1994: 39). In whatever way such myths are interpreted, just like fossils, they represent creatures which *became* images on rock long before human beings *created* images on rock. These ideas may reflect Aboriginal memories of fossil observation passed down through many generations in mythological form. Only by Eurocentric pre-conditioning would we not consider the possibility that indigenous peoples could formulate their own accurate explanations for fossils. That the Aborigines have long been, and still are, aware of fossils is well established (e.g. Whitehouse 1948; Gill 1957; Pretty 1977; Oakley 1978, 1985; Flood 1990).

The physical evidence

Observation and collecting of fossils during Palaeolithic times

The 'natural representations theory' might be dismissed as mere speculation were it not for the fact that human observation of fossils during the Lower, Middle and Upper Palaeolithic is well-established archaeologically. There is evidence of fossils having been collected as far back as 250 000 years ago. By the beginnings of the Upper Palaeolithic, collected fossils and shells are found as standard fare in prehistoric habitation and ritual burial sites (Breuil and Lantier 1959; Leroi-Gourhan 1964; Binford 1968; Soffer 1985; Taborin 1993a, 1993b).[4]

It is not surprising that fossils (especially inverte-

[2] Similar testing might also be conducted with human infants and pre-school children.

[3] For an overview on the development of Western ideas concerning fossils see Rudwick 1985.

[4] Fossils collected by Acheulians include, from England, *Spondylus* pelecypod and *Conulus* echinoid — central 'ornaments' in two carefully worked handaxes, *Micraster* echinoid — reworked into a scraper, two humanly flaked sections of *Isastraea* colonial coral carried from a distant source, and a shark tooth (Oakley 1971, 1973, 1975, 1978, 1981, 1985); crinoid columnals possibly collected and worn as beads, Israel (Goren-Inbar et al. 1991); and *Coscinopora* (*Porosphaera*) sponges possibly worn as beads, England (Marshack 1991b). Fossils collected by Mousterians include a large, turreted gastropod, *Chemnitzia*, and a spherical colonial coral, France (Leroi-Gourhan 1964); a *Dentalium* shell possibly worn as a personal ornament, France (Rigaud 1988; Marshack 1991a: 380); reworked shark teeth, Belgium (Van Neer 1979; Huyge 1990), and another example from Afghanistan (Duprée 1972; White 1992); belemnites, possibly reworked, Hungary (Vértes 1964; Oakley 1978); and a reworked nummulite (giant foraminifer), Hungary (Vértes 1964; Oakley 1978; Marshack 1990; Bednarik 1995). Fossils collected by Châtelperronians include a *Rhynchonella* brachiopod reworked as a personal ornament, a perforated belemnite, and crinoid columnals presumably worn as beads (Leroi-Gourhan 1961, 1964; Movius 1969; d'Errico et al. 1998), *Glycymeris* pelecypod, *Ancillaria*, *Athleta*, *Bayana*, *Clavillithes*, *Crommium*, *Sycum*, *Turritella* and *Tympanotonos* (*Potomides*) gastropods, France (Taborin 1993a). Fossils collected by Aurignacians and other early Upper Palaeolithic people since about 38 000 BP include belemnites and corals reworked for suspension as personal ornaments, Russia (White 1992, 1993a, 1993b). From the Aurignacian onward, examples of fossil collecting are far too numerous to list here. Suffice it to say that ammonites, belemnites, scaphopods, gastropods, pelecypods, brachiopods, crinoids, echinoids and other echinoderms, corals, sponges, stromatoparoids, marine worms, foraminifera, wood, shark teeth and even a trilobite were all collected — many reworked and presumably worn as personal ornaments (see the works of Oakley, Taborin, Soffer, White, Lejeune, David, Dance, Marshack, Leroi-Gourhan and others).

brate) would have been noticed; they are quite abundant in the natural world, and may be found anywhere on the earth where sedimentary rocks are exposed. They are present in flint, chert and other core elements from which stone tools are made. Metamorphic rocks such as marble and slate also contain fossils. (Fossils are rare, though not unknown, in igneous rocks. See Robin [1992: 130] for an excellent example of a fish fossilised by an underwater lava flow.) Even where no surface bedrock is present, fossils transported naturally from distant sources may be found in glacial deposits.

Fossils were also visible in the caves and rockshelters where early people lived. The famous sites of the French Périgord, for instance, are formed entirely of limestone containing the fossil shells of marine organisms (Delluc and Delluc 1991, 1978; David 1985; Laville et al. 1980; Judson 1975; Laville 1975; Debelmas 1974; Fenelon 1951; Abrard 1948). Such fossils were observable not only in the cave and shelter walls but also on the very floors (of *éboulis*[5]) upon which prehistoric people sat. The most readily cited evidence for this are the fossiliferous limestone slabs upon which Aurignacians created the earliest bas-reliefs (Delluc and Delluc 1991, 1978).

As one specific example of *éboulis* fossil experience, brachiopods from the rock walls of the Abri Pataud (Dordogne, France) were discovered in five of the twelve habitation levels excavated, spanning a time period between 32 000 and 23 000 years BP (David 1985; Dance 1975). As evidence that the inhabitants of the Abri Pataud were aware of such fossils, and interested in fossils, in general, it is known that they collected fossil gastropods, ammonites, echinoids and shark teeth from localities other than the abri, as far back as 33 000 years BP.

In Palaeolithic times, fossils were often collected and transported hundreds, possibly thousands of miles (Leroi-Gourhan 1964; Oakley 1965, 1978, 1985; Bahn 1977, 1997, 1998; Soffer 1985; Conkey 1985; White 1989a; Taborin 1993a, 1993b). This is known because fossils can sometimes be traced back to the very beds from which their Palaeolithic collectors obtained them. This traceability of fossils has been indispensable in the development of ideas concerning prehistoric migrations and possible trade networks over great distances. The practice of transporting fossils over great distances is cited as evidence of their importance in the culture of prehistoric societies.[6]

[5] Stone naturally dislodged from the cave or shelter ceilings and walls [clast].

[6] Prehistoric people undoubtedly collected many more fossils than are known from the archaeological record. This assertion relates primarily to matters of excavation quality and resulting inventories. There is, first of all, a conspicuous discrepancy between cave site and open air site inventories. According to Hahn (1972: 260), the less exacting excavation techniques applied to cave sites likely resulted in the non-reporting of smaller objects [such as fossils and shells]. As case in point, of the eighteen Aurignacian sites he discusses, shells, both contemporary and fossil forms, were reported from nearly all of the open air sites, whereas none, whatsoever, were reported from the cave sites (Hahn 1972, 1977). [How many important sites, after all, excavated prior to Movius' excavation of the Abri Pataud 1953, 1958-64 (Movius 1975) which produced many fossil shells, can be said to have received a thorough treatment? (See Laville et al. 1980: 6.)] But most damaging to inventory credibility was the old 'museum approach' to archaeology. For instance, at an Aurignacian site where exquisite sculptures were discovered (Vogelherd), Hahn suggests that the smaller objects [including fossils and shells] were simply 'not recovered' (Hahn 1972: 260). As we now understand all too well, such biased sampling inevitably results in inaccurate or, at best, incomplete interpretations of archaeological data (Bednarik 1994b). In conclusion, both questionable standards as well as inadequate excavation techniques easily account for the non-recording of fossils and shells from sites which, likely, would have contained them.

PART II

PERSPECTIVES ON THE TRANSITION FROM NATURAL TO ARTIFICIAL REPRESENTATION

Revealing and emphasising natural imagery through the making of stone tools

Retrospective predictability No. 1: Acheulian fossil collecting

Once controversial, evidence pointing toward personal ornamentation and symbolic or image-making skills in the Acheulian is increasingly being cited in the present decade (Bednarik 1993, 1995; Bahn 1991, 1997, 1998; Bradshaw and Rogers 1993; Bradshaw 1997; Marshack 1988, 1991b, 1997; Goren-Inbar et al. 1991, 1995; Hayden 1993). The evidence includes petroglyphs, portable engravings, fossil-ornamented stone tools, personal ornaments (including possible fossil ornaments), and an example of a 'figurine'. It is noteworthy that these developments, primarily in the medium of rock, coincide chronologically with the earliest examples of fossil collecting and the working of stone artefacts to highlight embedded fossils.

In the words of Oakley, the Acheulians are the first people known to have 'paid attention to fossils' (1973: 59). But this mindfulness has a certain retrospective predictability about it. Namely, the refinements in toolmaking which occurred during the Acheulian are undeniably synonymous with the fact that the makers of the tools were paying closer attention to the rock with which they were making their tools. Flint, chert and other core substances often contain fossils. It is hard to imagine that fossils would not have been considered, or, more likely, deeply pondered, as they periodically popped into view in the process of stone toolmaking.

Self-contained referent/icons

Through making stone tools (with fossiliferous core materials), prehistoric people would have had innumerable opportunities to observe both mould and cast of individual fossils, simultaneously. Both the mould (the negative likeness) and cast of a fossil are readily seen when rocks are cracked open. Hence, the two corresponding halves can easily be matched. This matching process has significant implications.

Observing both moulds and casts, prehistoric persons would, certainly, have grasped their relatedness, particularly if they observed the process of the casts coming

out from the moulds. Understanding that the two halves were related, and that each half implied the other, is a cognitive step well within reach of any prehistoric person intelligent enough to make a 'handaxe'. It would not have required a great leap of cognition for such a person to realise that the mould of a fossil *represented* the cast of the fossil, because the mould would have sufficiently and immediately communicated the existence of the cast.[7]

Actively revealing natural representations and making images visible

Cracking open rocks and revealing natural images could have caused prehistoric persons to think that their efforts played a part in creating those images. These persons would indeed have been actively responsible for *making images visible*. The process of revealing natural iconic imagery (of varying levels of iconic quality) over hundreds of millennia might also prime the capacity for projection of iconicity into randomly-made human markings (as per Davis 1986; see also Bednarik 1994a). The theory that man-made representation evolved out of natural representation fits well with Davidson and Noble's assertion that there could have been no intention to depict if there were not first the knowledge of the 'possibility' of depiction (1989: 129).

The earliest iconic image 'framed' by a human being

The most famous example of fossil collecting by early humans is an Acheulian handaxe from West Tofts, Norfolk, in England, which contains a fossil scallop shell (*Spondylus spinosus*). The artefact, dated at about 250 000 BP, was first brought to academic attention by Oakley (1973, 1981) and continues to be a principal citation in discussions on early 'aesthetic sensibilities' (e.g. Pfeiffer 1982; Dissanayake 1989; Hayden 1993; Bradshaw and Rogers 1993; Bradshaw 1997; Bahn 1997, 1998).

Oakley noted that the fossil was on a weathered portion of the block of flint from which the tool was fashioned, suggesting that the stone may have been chosen because of the fossil visible on its surface. He also noted that a great deal of care had been taken to avoid chipping the fossil while shaping the stone into a handaxe, and that the fossil was left occupying a central position in the finished tool.

The chipped area of the implement approaches closely three-quarters of the fossil's perimeter without touching the fossil; the effect is that of *framing* the fossil. The chipped outline of the handaxe itself further serves to *frame* the fossil within a conventional Acheulian design. Since the fossil was visible before the stone was worked, the possibility that the fossil influenced the shaping of the handaxe cannot be ignored. As Schapiro (1969: 228) might describe it, 'The image comes first and the frame is traced around it' (Fig. 2a).

Although always noted that the fossil is emphasised by its central positioning, exactly how central a position this is had never been explored prior to my geometric studies circulated in earlier drafts of this paper (1993–1995) which I reproduce here at 75% reduction. The studies were made using two-dimensional line drawings of the artefact (actual size 135 mm × 78 mm). Reference points were established differently in each to see if different approaches would yield similar results. In the first study, I created a non-arbitrary triangle reference based on the artefact's longest dimensions (Fig. 2a). In the second study, I divided the artefact into four equal quadrants of two-dimensional surface area (starting with a vertical line from the artefact's non-arbitrary, assumed utilitarian, point — here designated as vertex (Fig. 2b). The results of these two studies support a deliberate design interpretation, and suggest a great precision of workmanship and sense of visual balance (consider Marshack 1990: 460–1; Gowlett 1984: 185–6):

Geometric study 1: Fig. 2a (× 0.75)

(1) In triangle *ABC*, median *AL* nearly bisects the umbo (or beak) of the fossil shell.
(2) Median lines *BN* and *CM* also contact the umbo within one millimetre of median *AL*.
(3) Centroid *T* (the point at which all three medians meet) is located directly 'beneath' the umbo of the fossil shell. In actual visual effect the shell is pointing directly at centroid *T*.
(4) Midpoints *M* and *N*, at which medians *BN* and *CM* contact the sides opposite their vertices, occur at the outer edges of the fossil shell. Hence, the triangle formed by *M*, *N* and centroid *T* is directly superimposed over the shape of the fossil shell. Note also that medians *BN* and *CM* follow the radiating rib lines of the fossil shell.
(5) Line *GH*, drawn through the centre of the fossil shell, divides the handaxe into two parts with equal edge measurements. These two parts, for convenience, will be called 'triangle' *AGH* and 'quadrilateral' *GBCH*. Specifically, the outline of the 'triangle' created by following the outer edge of the handaxe is approximately 241 mm. The outline of the 'quadrilateral' created by following the outer edge of the handaxe is also approximately 241 mm.

Geometric study 2: Fig. 2b (× 0.75)

(1) When an image of the handaxe is divided lengthwise into two halves of equal surface area (approximately 37.5 square centimetres each), bisector line *WX* crosses directly through the umbo of the fossil shell.
(2) When the handaxe is subdivided into four parts of equal surface area (approximately 18.75 square centimetres each), geometric centre *R* is determined.

[7] Fossil moulds and casts may have played another part in the development of early man's abstract thinking. They may have assisted him in grasping the *concept of opposites*. More so than any other natural phenomenon, fossil moulds and casts display opposite images instantaneously, when fossiliferous rocks are cracked open. The significance of this instantaneous effect is that two opposite images can be compared side-by-side the moment they are discovered. Since much of Palaeolithic technology revolved around the working of stone, it can be assumed that such experiences occurred on a regular basis.

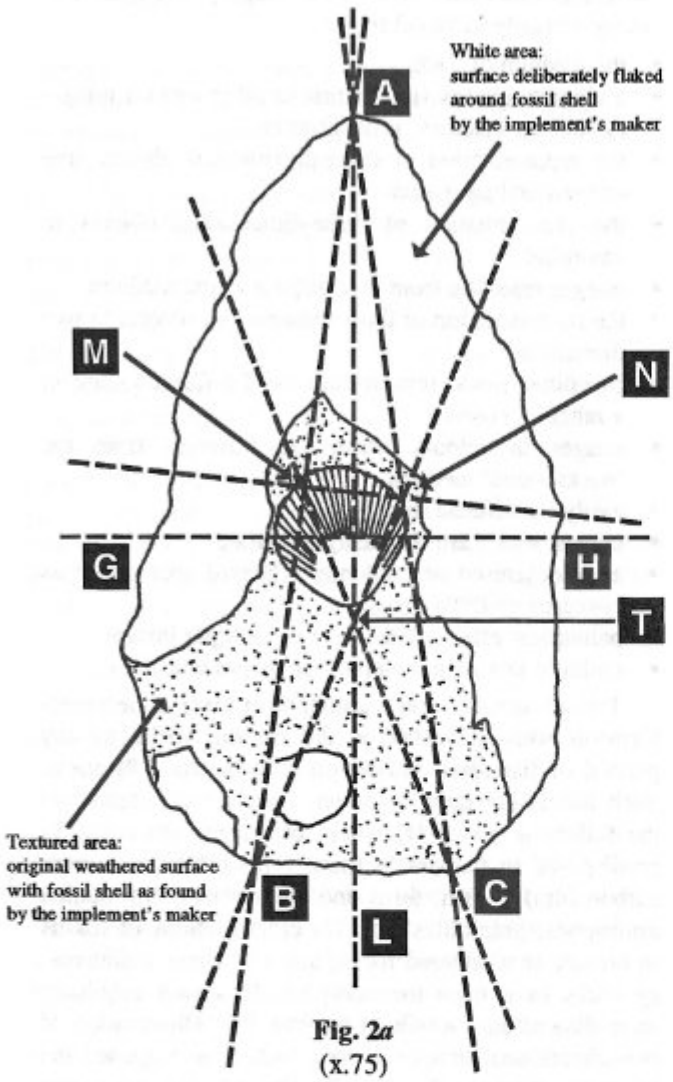


Fig. 2*a*
(x.75)

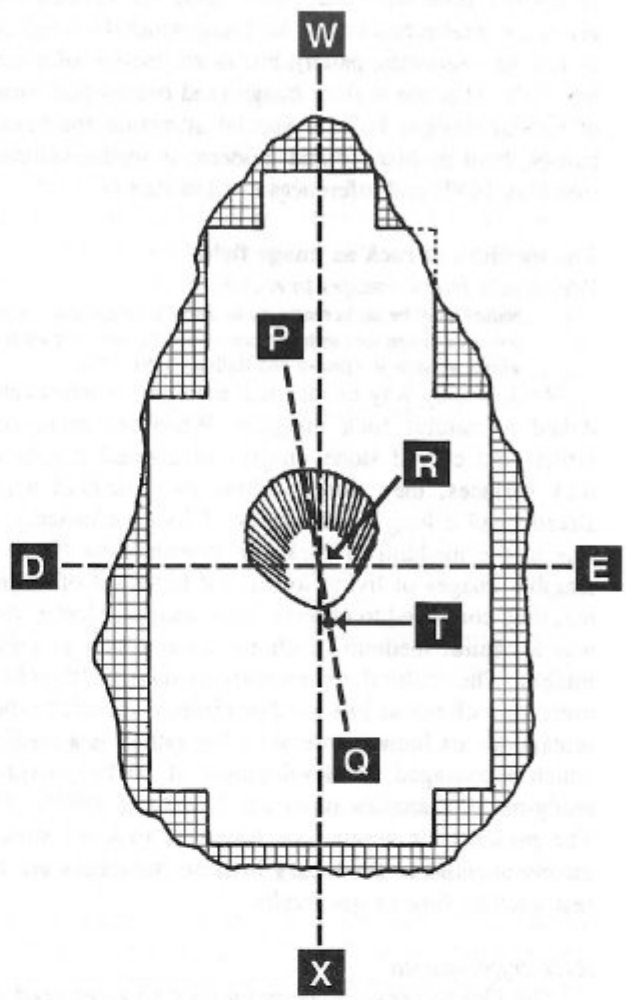


Fig. 2*b*
(x.75)

Figure 2. *Centrality and symmetry of 'iconic image' in the West Tofts handaxe.*

This central point is synonymous with the central point of the ellipse suggested by the smoothed portion of the fossil shell.

(3) If a line (*PQ*) is drawn from point *R* through the centre of the umbo of the fossil shell, the shell is divided into two near-equal parts. Line *PQ* also crosses centroid point *T* (determined in Fig. 2a). Put in other words, a line drawn between geometric centre *R* and centroid point *T* follows the central rib lines of the fossil shell.

Apart from the fossil's remarkable centrality, there is the equally interesting factor of its symmetry. Like the handaxe itself, the fossil shell is of the bilaterally-symmetric variety (Superfamily Pectinacea — scallop-like); and, for all practical purposes, the shell can be said to be in symmetrical alignment within the artefact, its umbo (or beak) pointing in the exact opposite direction as the point of the handaxe. This symmetrical alignment between fossil and artefact suggests an interest in bilateral symmetry apart from that indicated by the making of bilaterally-symmetric, tear-shaped tools. This is significant since the bilaterally-symmetric shapes of Acheulian handaxes are continually cited as one of the earliest signs of 'aesthetic' interest. Symmetrical alignments have been noted in other artefacts from this time period as well (e.g. Bednarik 1988: 99).

But perhaps the most profound implication of the West Tofts handaxe is that it contains an *iconic image* framed by a human being. Previous discussions of the artefact, for no apparent reason, seem to limit its maker to seeing the fossil shell as little more than an 'interesting pattern'. But this unnecessary perspective presupposes that the toolmaker never saw a living shell! Various pectinidae such as *Chlamys varia* (Variegated Scallop), *Chlamys* (*Aequipecten*) *opercularis* (Queen Scallop), and *Pectin maximus* (Great Scallop), are common along the not-too-distant coastline, as are many other shells (Brand 1991; McMillan 1968; Tebble 1966). Assuming similar fauna 250 000 years ago, it is only

befitting that our Acheulian toolmaker (and/or any others of his/her time who may have seen the handaxe) be given the intellectual credit for recognising the fossil not as just an interesting pattern but as an 'image' of a scallop shell. That the scallop image (and brachiopod image of similar design) holds a special attraction for human beings, both prehistoric and modern, is well-established (see Cox 1957, and references cited in Part I).

The medium of rock as image field

Why create iconic images in rock?

> Nature may be so perverse as to make it likely that we will present a stolen idea as being our own to the very person from whom we stole it. (Brown and Halliday 1991: 487)

Rock art, by way of identical medium, is irrevocably linked to natural rock imagery. Whenever prehistoric artists first carved stone images, or created images on rock surfaces, they were working in a medium which already had a long prior history of its own imagery. It was in the medium of rock that humans first observed tangible images of living forms; for hundreds of millennia, they continued to observe these images. Hence, rock was a natural medium of choice upon which to *create* images. The 'natural representations theory', therefore, presents rock not as just another medium in which representational art found expression, but rather as a medium which encouraged the development of art by providing ready-made examples (consider Marshack 1991b: 57). The presence or absence of fossils at rock art sites is inconsequential to the theory because influences are not restricted by time or geography.

Race cryptomnesia

The idea to create imagery on rock surfaces need not even have been consciously acquired, as anyone who has studied or has had direct experience with cryptomnesia well knows. Cryptomnesia, the 'unconscious influence of memory that causes current thoughts to be (wrongly) experienced as novel or original inventions' (Taylor 1965: 1111), shows itself most dynamically in creative acts. The effects of cryptomnesia can occur almost immediately after one's exposure to an idea (Brown and Murphy 1989; Marsh and Bower 1993) or over the span of an entire lifetime (Trosman 1969; Brown and Halliday 1991).

The possibility of a cryptomnesic factor in the development of rock art cannot be ignored, for it is well known that individuals, as well as human groups of any size (including humanity as a whole), often 'forget' the influences and steps by which they came to arrive at their present ideas, abilities or conditions. Certainly, the observing of fossil plant and animal images on rock surfaces, and the collecting of fossil shells for untold millennia played a role in the development of rock art.

Retrospective predictability No. 2: what rock art and fossils have in common

If fossils were influential in the development of rock art, then we would expect rock art to have characteristics which are similar to the pre-existing imagery (see Trosman 1969: 493). And, such is the case. Both rock art and the earlier-established fossil imagery share the following virtually identical traits:

- the medium of rock
- a tangible quality (in contrast to other natural imagery such as shadows, reflections etc.)
- the representation of three-dimensional objects free of surrounding matrix
- the representation of three-dimensional objects in bas-relief
- images resulting from indentations in the medium
- the representation of three-dimensional objects in two dimensions
- two-dimensional representations of a filmic nature in a range of colours
- images in colours which are different from the 'background' medium
- easily identifiable images
- images which are not easily identified
- an unorganised or randomly scattered appearance as concerns multiple images
- palimpsest effects in the case of multiple images
- multiple images in a variety of shapes and sizes

Two-dimensional representation of three-dimensional forms is well-established in the natural world, as any perusal of flat fossil images on rock matrix will attest. Such fossils are quite common, having been created in the following ways: (1) where organisms are naturally predisposed to flatness in fossil form (often as a mere carbon film) — fish, ferns and other plants, soft-bodied arthropods, graptolites etc.; (2) cross-sections of fossils in broken or weathered rocks; and (3) where sedimentary rocks have been metamorphosed causing originally three-dimensional fossils to become flat. Observation of two-dimensional images in rock would have opened the cognitive door to the possibilities of engraving and painting. (It is notable that fossil graptolites were so named because they resembled writing, painting, and other markings on rock surfaces.)

Multiple rock art images on rock surfaces, particularly those with enigmatic signs and patterns, often have an unorganised or randomly scattered look (see especially Shee Twohig 1981; Dowson 1992; Delluc and Delluc 1978; and Breuil 1933, 1935). But this is the exact manner in which plant and marine fossils have long been 'displayed' on rock surfaces. Rock art images are also sometimes superimposed one over another, creating a palimpsest effect. But this effect, too, is a standard trait of multiple fossils on rock surfaces.

The many similarities between rock 'art' and the various kinds of fossil preservation cannot be inadvertently dismissed as mere coincidence. That these two forms of representation might somehow be related is further demonstrated by the fact that various fossil manifestations are sometimes mistaken for rock art (Bahn 1998: 100). Even trained archaeologists sometimes err in distinguishing between rock art and naturally-occurring phenomena in rock (Bednarik 1994a). Since rock art mimics traits which have long been characteristic of

natural rock imagery, it must be considered possible that natural imagery influenced the development of rock art.

The substitutional aspect of representation and the Middle/Upper Palaeolithic transition in Europe

Substitution via natural objects

The 'natural representations theory' requires only that early people notice the obvious connection between living things and their duplicate existence in rock. I propose that such observation led to the most easily grasped use of representation, that which does not require any act of creativity — substitution. Following Gombrich (1961, 1963), Carrier suggests that the making of images is 'ultimately grounded in the human capacity to treat one thing as a substitute for another' (Carrier 1986, 1984).

At what point in pre-History is substitution first evidenced? It has sometimes been suggested that ochre may have been used in Palaeolithic burial rituals as a substitute for blood (e.g. Marshack 1986). But the mere presence of ochre or ochre-stained objects at Palaeolithic sites is insufficient evidence for such a conclusion (Flood 1983: 171; Conkey 1983; Bednarik 1988). The same may be said of possible synecdochical substitutions. However, that substitutive associations were made via fossils during the Middle/Upper Palaeolithic transition is supported by strong archaeological evidence.

Aurignacian people recognised the similarity between 'living shells' (herein defined as the shells of contemporaneously living molluscs) and those found in Tertiary sediments for they commonly 'substituted' fossil shells for those collected from active beaches (Leroi-Gourhan 1964: 71; Oakley 1978). They even collected both living and fossil forms of the exact same species (Taborin 1993a, 1993b). Remnants of Aurignacian necklaces made of both living and fossil shells is evidence that living and fossil shells were compared, side by side.

The subtle differences (in weight, colour and texture) between living shells and fossil shells were 'just enough' to be noticeable. It was the noticing that fossil shells were similar to, but not the same as, contemporary shells which would have sparked the idea of substitution. In other words, identical, three-dimensional shape and size would have assured association; differences in weight, colour and texture would have taught the concept of alternate media or substitution. It is reasonable to conclude that as Aurignacian people substituted fossil shells for contemporary shells that they were, in effect, learning the *concept* of substitution.

Substitution via artificially-made objects

From the 'archaeological record' as we know it today, it is readily observed that an increase of fossil collecting occurred during the Middle to Upper Palaeolithic transition. This increase occurs just prior to the earliest Aurignacian three-dimensional representations. Now, if we accept the notion that fossil shells are natural, three-dimensional representations, then the possible connection between Aurignacian fossil collecting and the advent of Aurignacian three-dimensional representation must be addressed. Could the process of substituting fossil shells for living shells have led Aurignacian people to the idea of making their own 'artificial' substitutes?

White has brought attention to several early Aurignacian (c. 34 000 BP) ivory beads which, in my view, may have resulted from just such a chain of events. The beads were apparently fashioned to duplicate the appearance of exotic gastropod shells which were recovered from the same levels at the same site, La Souquette, France (White 1989b; see also 1989c). The punctuated pattern on the shell depictions is a faithful reproduction of that known from the gastropod shells themselves, e.g. *Pirenella plicata* (White 1989a). These 'gastropod sculptures', as they may be called, predate the human and mammal sculptures from Galgenberg, Austria; and Vogelherd, Geissenklösterle and Hohlenstein-Stadel, Germany, by as much as 2000 years.

The archaeological context of these shell sculptures is significant. La Souquette and the two contiguous sites (Blanchard and Castanet) contained an unusually large number of shells, *both* contemporary and fossil forms (Taborin 1993a, 1993b). Hence, at these three neighbouring sites were found all of the elements necessary to support the following developmental sequence:

(1) contemporary shells from active beaches compared with
(2) 'natural representations' of shells (fossils from the rocks and marls) followed by
(3) 'artificially-made representations' of shells.

Other Aurignacian gastropod sculptures were carved out of rock (White 1992, 1993a). There is also an example from the Magdalenian of France (Lascaux), a rock apparently carved to resemble a gastropod shell from the same site (Taborin 1979). Fossil gastropods and carved limestone duplicates (as well as clay models of the fossils) were discovered in the so-called Neolithic 'temple' sites in Malta (Oakley 1965, 1978). (There exists, too, a beautifully-intricate Minoan gastropod sculpture from Crete carved out of obsidian [Dixon et al. 1976].) Gastropod sculptures carved out of rock are further evidence that fossil shells may have been a stimulus in the creation of three-dimensional representations in rock. At the very least, they indicate that prehistoric people found shells to be a worthy subject for iconic imitation.

PART III

FOSSILS AS REFERENTS FOR AMBIGUOUS PREHISTORIC ICONOGRAPHY

The 'fossil depictions theory'

The basic 'non-representational' geometric shapes

There are many prehistoric art images which do not immediately appear to represent animals or human beings. These are geometric shapes or constructs of various geometric shapes. Because they are not immediately identifiable, they are traditionally referred to as 'abstract signs', 'non-figuratives', or simply, 'non-representational

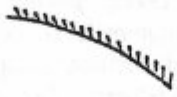
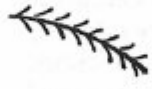
	Unexplained and 'schematized' signs created on stone by prehistoric people as far back as 28 000 years ago		Fossil invertebrates and plants preserved in stone for up to 475 million years	
a	Abstract sign, Kostienki, Russia, c. 28 000 BP. (after Leroi-Gourhan 1967:515)			*Strophomena*, brachiopod, Ordovician period, approx. 475 million yrs. old (after Fenton and Fenton 1989:164)
b	One-sided barbed sign, Lascaux, France, c. 17 000 BP. (after Leroi-Gourhan 1967:514)			*Monograptus*, graptolite, Ordovician period, approx. 475 million yrs. old (after Thompson 1982: Pl. 463)
c	Abstract sign, Ussat, France, c. 17 000 BP. (after Leroi-Gourhan 1967:514)			*Allorisma*, pelecypod, Permian period, approx. 250 million yrs. old (after Case 1982:56)
d	Inscribed 'fir-man,' Sierra d'Elechal, Badajoz, Spain, Neolithic–Bronze Age (after Breuil 1933a: Pl. XXV)			*Agassizocrinus*, crinoid, Mississippian period, approx. 330 million yrs. old (after Moore and Teichert 1978: Fig.450)
e	Spiral figure on reindeer horn, France, c. 17 000 BP. (after Graziosi 1960: Pl. 95)			*Lytoceras*, ammonite, Cretaceous period, approx. 100 million yrs. old (after Fenton and Fenton 1989:284)
f	Barbed sign, Lascaux, France, c. 17 000 BP. (after Leroi-Gourhan 1967:516)			*Pagiophyllum* leaf, Cretaceous period, approx. 100 million yrs. old (after Thompson 1982: Pl. 495)
g	Triangular sign, Les Eyzies, France, c. 17 000 BP. (after Leroi-Gourhan 1967:513)			*Dicoelosia*, brachiopod, Devonian period, approx. 375 million yrs. old (after Fenton and Fenton 1989:162)
h	Radially symmetric ivory bead, Sunger, Russia, c. 28 000 BP. (after White 1993*a*:293)			Common crinoid columnal, Ordovician to Recent (after Fenton and Fenton 1989:303)
i	Barbed sign, Lascaux, France, c. 17 000 BP. (after Leroi-Gourhan 1967:516)			*Alethopteris*, seed fern, Pennsylvanian period, approx. 300 million yrs. old (after Case 1982:189)

Figure 3. *Enigmatic prehistoric artworks as compared with representatives of various fossil phyla.*

geometric patterns'. But each of these classifications makes a serious presumption, namely, that prehistoric persons would not have created representational images of anything other than easily-recognised animals or humans. The placement of motifs into such categories may be due to the broader general interest in and general knowledge of larger over smaller, and terrestrial over aquatic living or fossil forms (consider Bednarik 1994b: 69; Noble and Davidson 1996: 75–81).

Readily apparent on rock as fossils is every basic geometric form imaginable. As elucidated in Parts I and II, fossils were of great interest to prehistoric people; their patterns and shapes, easily remembered, could just as easily have been copied. If such forms were indeed copied, the resulting artworks would, of course, be *representational*. Prehistoric signs which have traditionally been classed as 'non-representational', and which could be reinterpreted as 'representational' in the light of fossils (not to mention other natural forms) include: straight line, arc, wavy line, zigzag, spiral, circle, ellipse, triangle, quadrilateral, pentagon, hexagon, and so forth. Even complex signs built from repetitions and combinations of geometric elements (e.g. radiating or parallel lines, filigrees, concentric circles, chains, lattices and grids, rows and other groupings of dots or cupules etc., *ad infinitum*) could represent common fossils. The popular claim that 'abstract signs' have no readily visible counterparts in the physical world, therefore, demands critical re-assessment.

Enigmatic prehistoric artworks and fossils side-by-side

The comparisons I offer in the following pages represent but a few examples from an immense number of 'enigmatic' prehistoric rock artworks worldwide which resemble common natural shapes long present in rock. The comparisons demonstrate that many such artworks may be *depictions* of fossils. It is doubtful that any prehistoric artist would have portrayed what he saw in the anatomically accurate style of a scientific illustrator. Despite this, many of the comparisons show details and proportional similarities which are hard to dismiss. Prehistorians commonly compare artworks from various prehistoric sites but the comparison of such art with fossils is, to the best of this author's knowledge, unique to this work.

The comparisons are presented in a taxonomically pyramidal manner, from very broad to specific and detailed, and from very simple patterning to more complex. Fig. 3 is a general overview comparing Upper Palaeolithic through Bronze Age enigmatic artworks with common fossils of various phyla. Fig. 4 compares fossils with motifs suggested as having been inspired by 'entoptic phenomena' or phosphene patterns. Fig. 5 focuses on images which are more complex, comparing them with arthropoda (trilobites and related forms). It demonstrates possible variations in depictive styles for one specific invertebrate group. These variations may also reflect noticeable distinctions between sub-groups and even genera of the organisms discussed. From the comparisons in Fig. 5, I have selected three of the most complex which I examine in detail proportionally, structurally, geographically and geologically in Figs. 6 and 7. [Note: The fossil images in this paper have been redrawn by the author from convenient rather than regionally-specific reference materials. Equivalent counterparts are known from the regions discussed.]

Natural images and 'entoptic' images

Lewis-Williams and Dowson (1988, 1993) and others have offered examples of Neolithic (and some Palaeolithic) artworks which they believe may have been inspired by 'entoptic phenomena' (visual sensations derived from the structure of the optic system). Lewis-Williams and Dowson focus on such patterns as they relate to 'shamanic' trance states. (See also Bednarik's non-shamanic 'phosphenes theory' — overview and references, 1995: 614.) I suggest that if the cited artworks (those associated with the geometric or 'non-iconic' of Lewis-Williams' and Dowson's Stage 1) are removed from the entoptic (or phosphene) context and are viewed instead in the context of palaeontology, it is not at all difficult to see them as iconic depictions of various fossil forms which have long been visible in the natural world. For example, many species of fossil brachiopods and pelecypods display one of the most often cited of 'entoptic' patterns — the zigzag (including the multiple row zigzag motif). It is readily seen in the shells of rhynchonellid brachiopods which have been collected by prehistoric people ever since the Châtelperronian, Aurignacian and Périgordian (Leroi-Gourhan 1964; Dance 1975; Oakley 1985; Taborin 1993a).

Without exception, all basic entoptic forms have abundant counterparts in the natural world of fossils. Therefore, alternative fossil images could be given for most of the geometric prehistoric motifs cited as entoptic by Lewis-Williams and Dowson, and others. However, for the purposes of this general overview, only a few examples will be given here.

Compare an engraved megalithic monument in Ireland cited as possibly inspired by entoptic phenomena (Bradley 1988; Lewis-Williams and Dowson 1993) with nummulite fossils (Figs. 4a, b). Nummulites are extremely large (often exceeding 10 cm) and abundant Eocene foraminifera. They are known in the British Isles where spiral motifs are common, and are 'widely used for ornamental purposes' (Fortey 1991: 55-6, 165). That nummulite fossils were noticed by prehistoric people is traced back to Mousterian and Magdalenian times (Bednarik 1995; Marshack 1991b, 1990; Taborin 1993a). Nummulite fossils, along with the much-collected spiralled ammonites and gastropods, likely represent the initial referential source for the spiral motifs common in prehistoric art. The fact that a large ammonite adorns the entrance stone of a Neolithic barrow near Bath, Great Britain (Oakley 1978), further supports a 'natural world' inspiration for spiral motifs in megalithic art.

Concentric circles and radiating lines or filigrees are also known as entoptic forms. However, these very same

forms are *common* in rock as fossils, visible primarily as cross-sections of corals, archaeocyathids and crinoid columnals. Consider the comparison of a New South Wales Aboriginal petroglyph, cited as possibly inspired by entoptic phenomena (Clegg 1988), with the radiating circular structure (septal pattern) of a common fossil coral (Figs 4c, d). The two similar figures Clegg reproduces can as easily be compared with the septal patterns of other species of fossil coral. Clegg's assertion, therefore, that such artworks 'do not look like anything' is simply not true. The fact that fossil corals are abundant in New South Wales (Branagan and Packham 1967; Laseron 1969) suggests that they should be considered as a possible referential source for complex 'non-figuratives'.

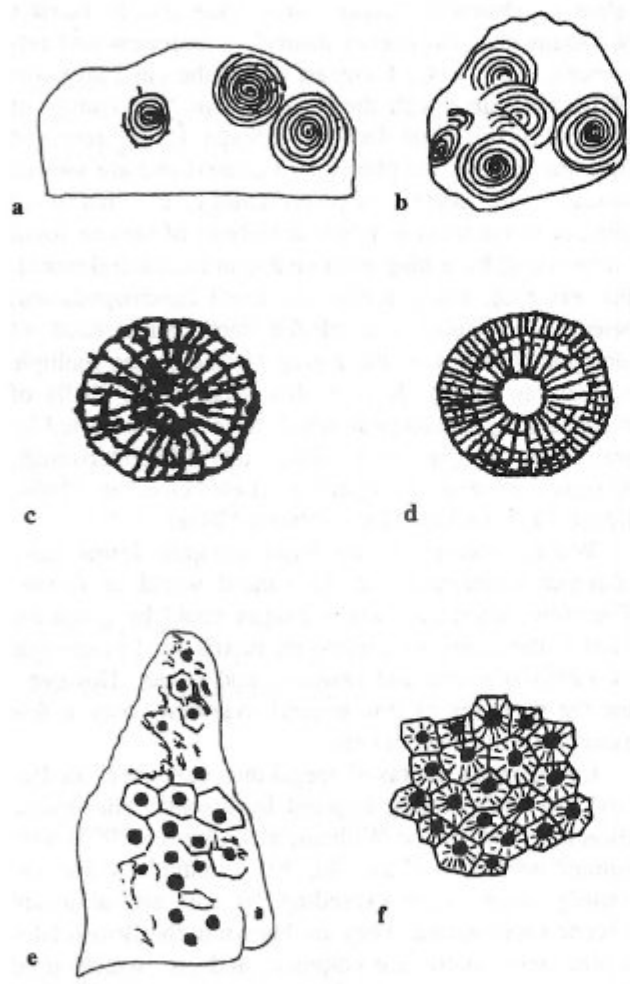


Figure 4.
'Entoptic' motifs in prehistoric rock art compared with common fossils. (a) Carved megalithic monument, Meath Co., Ireland (after Shee Twohig 1981: Fig. 216). (b) Nummulites, fossils of giant foraminifera (after Fischer and Gayrard-Valy 1978: Pl. 32). (c) 'Complex non-figurative' petroglyph, Sturt's Meadows, New South Wales, Australia (after Clegg 1988). (d) Eridophyllum, *fossil solitary coral (after Fenton and Fenton 1989: 129). (e) Carved stone monument, Yorkshire, England (after McMann 1980: Fig. 101). (f)* Hexagonaria, *fossil colony coral (after Fenton and Fenton 1989: 133, portion only).*

Other entoptic motifs consist of grouped dots or cupules, and grouped zigzag or hexagonal figures. (Man-made cupules are known from Acheulian times in India, and Mousterian equivalent times in Europe and Australia [Bednarik 1993, 1995; Bahn 1997] through to the present.) But these patterns too, are *abundant* on rock in the form of fossils, being most often seen in colonial corals. That such fossils were noticed by prehistoric people is traced as far back as the Acheulian (Oakley 1971, 1981). Consider the comparison of a Neolithic carved stone monument in England with the cosmopolitan colonial coral *Hexagonaria* (Figs 4e, f).[8]

Complex enigmatic images and trilobites

In contrast to artworks of the simple geometric variety, those in Fig. 6 can be compared with very few things in the natural world. I suggest that these images demonstrate, to an exceptional degree, the definitive structures and proportions of trilobites, and can be compared with trilobites more readily and more completely than with any other form. Every aspect of these paintings (with the exception of a few small lines in Fig. 6c) can, in fact, be matched to the various structural parts of trilobite exoskeletons. These images are as anatomically correct and recognisable as trilobites, as are the paintings at Lascaux anatomically correct and recognisable as horses and bulls. The likely deterrent to such identification is that fewer individuals are familiar with or interested in trilobites as opposed to horses and bulls. Hence, the majority of researchers more readily identify horses and bulls than trilobites in possible depictions, regardless of how accurately or to what degree of detail they are portrayed.

Fig. 6a is a Neolithic–Bronze Age rock painting at the site of Peñon del Collado del Aguila, north of Solana del Piño, in the Sierra Morena (Ciudad Real Province, Spain).[9] The painted figure measures approximately 22 cm in length.[10] It is on a rock face containing other images which also resemble trilobites. The trilobite type with which it is compared, *Dalmanites* (Fig. 6b), and genera of similar appearance (e.g. *Pterygometopus*, *Chattiaspis*, *Eudolatites* etc.) have long been known throughout the Sierra Morena. Distinguishing features of these trilobites are large eyes and elongated genal and posterior spines. The Dalmanites drawing I provide demonstrates the general features of these trilobites. Some types have extremely long genal and posterior spines which more closely resemble those of the Neolithic–Bronze Age image (see Moore 1959). Maximum length is approx. 12 cm.

Fig. 6c is a Neolithic–Bronze Age rock painting at

[8] Earlier drafts of this paper (excluding 1993–1994) explored the compatibility of the 'fossil depictions hypothesis' and Lewis-Williams' and Dowson's neuropsychological model.

[9] Dating of the artworks cited in this section has long been problematic. Since the 'fossil depictions theory' is not contingent upon the chronology issue, I have adopted a broad Neolithic–Bronze Age designation based on convenient reference materials, primarily Jorda (1974), Beltrán (1982), Hernandez et al. (1988) and Bahn (1989).

[10] Redrawn after Breuil 1933b: Fig. 29 and Pl. XXVI.

	Unexplained and 'schematized' signs created on stone by prehistoric people as far back as 18 000 years ago		Fossil trilobites and crustaceans preserved in stone for up to 550 million years	
a	'Dolmenic idol,' Solana del Pino, Ciudad Real, Spain, Neolithic–Bronze Age (after Breuil 1933*b*: Fig.29)			*Dalmanites*, Silurian period, approx. 425 million yrs. old (after Fenton and Fenton 1989:201)
b	Oval design, Le Tuc D'Audoubert, Ariège, France, c. 14 000 BP. (after Leroi-Gourhan 1967:454)			*Pseudodoniscus*, Silurian period, approx. 425 million yrs. old (after Fenton and Fenton 1989:224)
c	'Bar motif,' Almaden, Ciudad Real, Spain, Neolithic–Bronze Age (after Breuil 1933*a*: Pl. VIII)			*Paradoxides*, Cambrian period, approx. 550 million yrs. old (after Levi-Setti 1993:98)
d	Abstract sign, Le Portel, Ariège, France, c. 18 000 BP. (after Leroi-Gourhan 1967:514)			*Albertella*, Cambrian period, approx. 550 million yrs. old (after Shimer and Shrock 1944:614)
e	Schematic motif, Alange, Badajoz, Spain, Neolithic–Bronze Age (after Breuil 1933*a*: Pl. XXXVI)			*Dalmanitina*, showing disarticulation, Silurian period, approx. 425 million yrs. old (after Shrock and Twenhofel 1953:603)
f	Schematic motif, Sierra de Hornachos, Badajoz, Spain, Neolithic–Bronze Age (after Breuil 1933*a*: Pl. XXIX)			*Poliellina*, Cambrian period, approx. 550 million yrs. old (after Moore 1955:Fig.164)
g	'Dolmenic idol,' Almaden, Ciudad Real, Spain, Neolithic–Bronze Age (after Breuil 1933*a*: Pl. VI)			*Belinurus*, Carboniferous period, approx. 300 million yrs. old (after Moore 1955: Fig.13)
h	Schematic motif, Fuencaliente, Ciudad Real, Spain, Neolithic–Bronze Age (after Breuil 1933*b*: Pl. XXXVII)			*Dipleura*, Devonian period, approx. 375 million yrs. old (after Case 1982:118)
i	Abstract sign, Lascaux, France, Magdalennian (after Leroi-Gourhan 1967:516)			*Paedumias*, Cambrian period, approx. 550 million yrs. old (after Fenton and Fenton 1989:197)

Figure 5. *Enigmatic prehistoric artworks as compared with fossil arthropods (trilobites and related forms).*

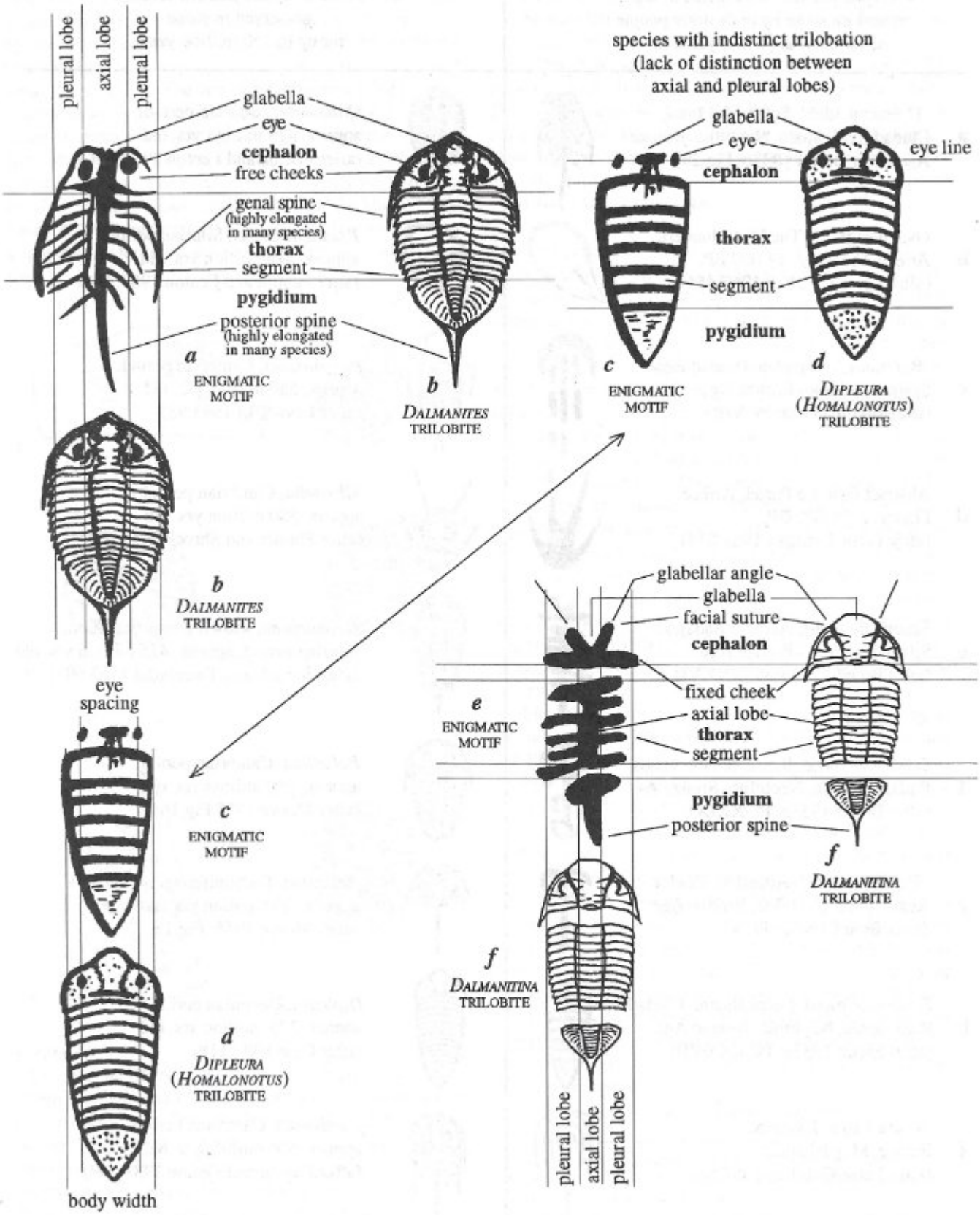


Figure 6. *Enigmatic Neolithic-Bronze Age rock paintings of south-central Iberia as compared with the structures and proportions of fossil trilobites of the same region.*

the site of El Escorialejo, east of Fuencaliente in the Sierra Morena (Ciudad Real Province, Spain).[11] The painted figure measures approximately 22 cm in length. It is on a rock face with several bi-triangular images, a few of which are likely schematics of human beings. Fig. 6c is the central image. Being unique and rendered in a completely different style, it seems out of place among the rest. The trilobite type with which it is compared, *Dipleura* (*Homalonotus*) (Fig. 6d) and related trilobite genera have long been known from the Sierra Morena. They reached a maximum length of approximately 18 cm. Essential features of these trilobites are indistinct trilobation (the separation between axial and pleural lobes) and indistinct segmentation in the pygidium. In comparing the two images, notice especially the horizontal and vertical eye lines and spacing as compared with divisions and proportions of body parts.[12]

Fig. 6e is a Neolithic–Bronze Age rock painting at the site of Sierra de Don Tellejo, south of Merida (Badajoz province, Spain).[13] The painted figure measures approximately 14 cm in length. It is on a rock face containing many other 'abstract' images. Trilobites have long been known from the Lower Paleozoic rocks of Badajoz and nearby regions in Portugal. Distinguishing features of *Dalmanitina* (with which the painting is compared) include elongated posterior spine, and strongly angular glabella. Fig. 6f is a 20th century graphic of *Dalmanitina* depicting the three principal body parts of a trilobite and the manner in which they commonly disarticulated.[14] Fig. 6e may document Neolithic–Bronze Age observation of a dalmanitid trilobite fossilised while in the process of disarticulation. (It is worth noting that a dalmanitid trilobite was collected in Magdalenian times; it was perforated for suspension as a personal ornament [Oakley 1985].)

[11] Redrawn after Breuil 1933b: Pl. XXXVII.

[12] It might be argued that I am interpreting individual images out of the context of surrounding images. But such a criticism rests entirely upon the 'context' one chooses to focus on and the other 'contexts' one chooses to ignore. Recently, the idea that the rock itself is an important factor in the context of rock art has been brought to the fore (Dowson 1992; Lewis-Williams et al. 1993). Hence, it might be counter-argued that any interpretation of a rock art image which ignores traits inherent in the rock itself is as out of context an interpretation as one which ignores nearby man-made images. Another factor clouding context issues are various cumulative effects. What may appear to the 'etic' observer as contextual associations may actually be the result of unrelated contributions by different artists (Lorblanchet 1988, 1992; Halverson 1987), or differently-motivated later additions by the original artist. Consider also process-oriented art wherein meanings and contexts are changed deliberately over time through sanctioned additions and alterations. Not knowing which are 'false contexts', not knowing whether or not 'serious' artworks had been interspersed with 'graffiti', and not knowing the significance of palimpsest effects make it impossible to determine with certainty just what groupings of prehistoric images were intended to be 'in context' (consider Walsh 1992; Ward 1992). In light of this discussion, I suggest that focusing on individual motifs is as valuable to the science as is seeking out what may prove to be arbitrary contextual associations.

[13] Redrawn after Breuil 1933a: Pl. XXXVI.

[14] Redrawn after Shrock and Twenhofel 1953: 603, with disarticulated free cheek re-integrated by the author.

Iberian sites with images resembling trilobites examined from a geological perspective

The region in which the schematic paintings were created contains surface rock of Lower to Middle Palaeozoic age (Cambrian, Ordovician, Silurian, Devonian), the geological time period in which trilobites flourished. It has long been known for its abundant and varied trilobite fauna — over 150 species.[15] Fig. 7 is a map of the Iberian peninsula with sites containing trilobite-like images superimposed over a simplified outline of pre-Mesozoic outcroppings. Most of the rocks within this outline are Palaeozoic, and contain abundant trilobite fossils.[16] It seems more than coincidence that twenty or more schematics in Breuil's assemblage from the same region can be compared with trilobites. Since trilobites are abundant in the regions in which the paintings were made, they should be considered as possible referents.[17]

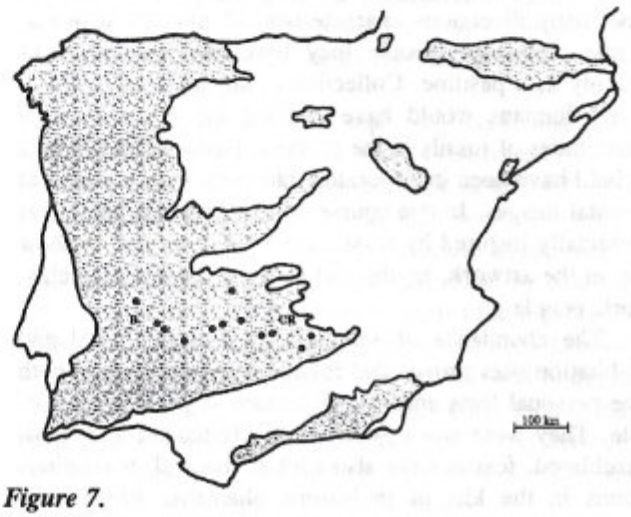


Figure 7.
Neolithic-Bronze Age rock art sites with paintings resembling trilobites, and their relationship to trilobite-bearing exposures of the Iberian peninsula.

• *Sites containing Neolithic-Bronze Age paintings which resemble trilobites.*

Simplified outline of pre-Mesozoic rocks, primarily trilobite-bearing Palaeozoic rocks. Some areas within the outline are Precambrian, post-Palaeozoic and igneous. The remaining, white area is post-Palaeozoic, of non-trilobite-bearing rocks.

B = *City of Badajoz*, CR = *City of Ciudad Real, Spain.*

[15] Linan et al. 1993; Bartoli 1992; Linan and Sdzuy 1990; Linan and Quesada 1990; Rabano 1984; Gutiérrez-Marco et al. 1984; Hammann et al. 1982; Hammann 1976a, 1976b, 1974, 1971; Vegas 1970; Llado et al. 1967; Bard 1964; Lotze 1961; Maass 1961; Triguero 1961; Thadeu 1947; Hernandez-Pacheco 1926; de Cortázar 1880; Gonzalo and Tarin 1879; de Prado 1855; Verneuil and Barrande 1855.

[16] Geologically, the map is a simplified amalgamation of the many maps consulted: Linan et al. 1993; sources cited in previous footnote; others in Dallmeyer and Garcia 1990; the standard peninsular geological maps etc.

[17] The rock art sites plotted correspond with the following numbers on Acanfora's 1960 map. They are (i–r): 43 (Albuquerque, Badajoz), 44 (Alange, Badajoz), 45 (Alange — my Figs 5e and 6e), 48 (Sierra de Hornachos, Badajoz), 49 (Sierra d'Elechal Badajoz), 50 (Cabeza del Buey, Badajoz), 35 (Hoz de la Guadiana, Cáceres), 34 (Almaden, Ciudad Real — my Figs 5c and 5g), 32 (Fuencaliente, Ciudad Real — my Figs 5h and 6c), 31 (Solana del Pino, Ciudad Real — my Figs 5a and 6a), 28 (Santa Elena, Jaen) and 29 (Aldeaquemada, Jaen).

Conclusion

At whatever time mankind first became 'conscious' in any sense of the word, fossils had long been present as part of the natural world in which humans lived. Fossils were literally on display in the great museum of nature, and on every continent where human beings developed visual representation — be it Africa, Europe, Asia, the Americas or Australia. Put in other terms, wherever humankind first became artistically aware, the mysteriously fascinating and aesthetically appealing shapes and patterns which are fossils were probably both present and noticed.

Palaeolithic and Neolithic people were in contact with rocks on a daily basis. The making of stone tools, in particular, would have given them reason to examine very closely the rocks they had gathered. And, lacking the many diversions characteristic of modern societies, some prehistoric people may have also studied rocks simply as a pastime. Collectively, the study of rocks by early humans would have entailed the observation of multitudes of fossils in the process. Hence, fossil images would have been incorporated into early man's palette of mental images. In due course, shapes, patterns and ideas originally inspired by fossils would be expected to show up in the artwork, myths and religious beliefs of prehistoric people.

The abundance of fossils in prehistoric burial and habitation sites proves that fossils were important in both the personal lives and overall culture of prehistoric people. They were worn as items of adornment; and in all likelihood, fossils were also kept as magical or religious items in the kits of prehistoric shamans. Along with actual artworks, fossils are invaluable indicators of the intimate psychology of prehistoric people. From Lower Palaeolithic times onward, the collecting of fossils may, in fact, be the earliest confirmed activity (supported by numerous archaeological examples) which cannot be directly connected to concerns of survival. In-depth study of this practice, therefore, would probably shed more light on the mental abilities, creativity and religious beliefs of prehistoric people than does the study of their practical technologies.

With the 'natural representations theory', I have offered a means by which prehistoric people could have learned the concept of visual representation prior to the creation of their own external imagery. This is put forward as a valid theory because both human children and other primates learn representation without actually making representations. I then offered several possible chronologies on how exposure to fossils may have spurred the transition from 'natural' to 'artificial' representation.

As concerns the 'fossil depictions theory', I have demonstrated not only that certain prehistoric artworks resemble fossils, but also that such fossils are known from the same regions as the artworks. Specialised regional studies based on the ideas put forth here have the potential of explaining a great number of enigmatic prehistoric artworks. The presence of fossils nearby or at rock art sites is hard physical evidence of referential plausibility — a factor which should be taken into account in future discussions of enigmatic prehistoric rock art.

Acknowledgments

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COMMENTS

Debris of the Biblical Flood

By ROBERT G. BEDNARIK

Feliks presents essentially two new hypotheses: the 'natural representations theory' and the 'fossil depictions theory'. The latter deals with the meaning of a small number of rock art images, which he tries to extend to a variety of 'non-iconic' motifs. Its proposition is neither refutable nor likely to have any great effect if it were valid. Do spiral motifs represent ammonites? Perhaps they do, but that would not affect any fundamental issues in the discipline. I see no more value in this theory than in any of a few dozen other generic 'interpretations' of Upper Palaeolithic art, or in any of hundreds of 'interpretations' we have of Holocene rock art.

The first proposition of Feliks, however, is in a totally different class, and it certainly renders his paper important. I regard it as the most innovative idea for some time on the general topic of early human cognition. The crux of the 'natural representations theory' is that it does provide a plausible, even convincing, explanation for a major conundrum: the 'invention' of a referent. I find the solution proposed by Feliks persuasive, and it blends well with the ideas of Davis (1986a) of which it is an almost natural extension. In fact it seems surprising that no-one has thought of this explanation before. But as so often in science, the most elegant solution of a research problem can be the most elusive. This is the most

important part of Feliks' generally original and carefully argued paper.

The concept of a referent is central to the origins of symbolism, which in turn is crucial to the development of hominid constructs of reality, to language, to cultural sophistication generally. The stumbling block of the referent has in the past led to various contorted solutions, such as the proposition that language was impossible without the availability of iconic depiction to convey the meaning of sound patterns. Culture is the word that describes the transference of knowledge by non-genetic means (Handwerker 1989), and the massive cultural explosion that seems to have occurred roughly between one million and 800 000 years ago has not only remained unexplained, it has remained largely unnoticed by archaeology. The textbooks say that the entire Lower Palaeolithic period is characterised by extreme technological conservatism, so the discipline assumes a corresponding cultural conservatism. Yet right in the middle of this *very* long time span, humans suddenly began to cross the sea (Bednarik 1997; see solid dating evidence in Morwood et al. 1998), to use pigment materials, and to collect or take an interest in crystals and fossil casts. The most important technological development in the entire history of mankind occurred when, for the very first time, hominids entrusted their lives to a contraption they had built, that harnessed the energies of nature — the humble bamboo raft was the forerunner of today's space craft. By the beginning of the Middle Pleistocene period, several deep-water islands of the Indonesian archipelago had become colonised by *Homo erectus*. The quantum jump in human development marked by this evidence has left its indelible mark on our species, whose progress has since been entirely dominated by our ability to culturally exploit the forces of nature.

In view of the technological competence involved in developing a nautical tradition, the cultural sophistication Feliks presumes for people with Lower Acheulian industries is amply justified. Certainly these people had a highly effective communication system, most probably language — sufficiently intricate to support the kind of technological complexity demanded by the Indonesian evidence. The fact that this is in complete contradiction to almost anything we have ever read or heard about these hominids is irrelevant: we have severely underestimated their capabilities, and the minimalist interpretations of Pleistocene archaeology were simply false all along.

A cautionary comment: the 'iconic' properties of the Makapansgat cobble are no evidence that this is why it became a manuport. Its visually most prominent feature is that of the 'staring eyes', an important visual stimulus in the animal world (Bednarik 1998), and being fascinated by them does not necessarily amount to what we might simplistically call 'iconic recognition'. Does an animal reacting to the eye-like markings on the wings of a butterfly recognise their iconicity? I doubt it. All we know with reasonable certainty is that the cobble was picked up and carried around, and we assume, quite reasonably, that this was because of its outstanding visual qualities.

There should be no doubt that palaeo-scientists of the Pleistocene searched for explanations for many of the phenomena they encountered, including fossil casts. Most certainly, such fossils were noticed hundreds of millennia ago, and on occasion collected and 'curated'. Feliks' geometric analysis of the West Tofts handaxe is a most original attempt to consider its morphology objectively. It will not convince the hard-line Eve supporters, or those who for ideological reasons prefer any interpretation that distances modern humans from the 'others'. They will no doubt try to define the statistical probability of such a configuration of fossil, tool morphology and knapping scars being the result of chance. In the final analysis, those of us who have long observed these many coincidences some archaeologists have been trying to explain away will have to insist that drilled teeth, ostrich eggshell beads and seafaring be given more attention. After all, such phenomena are considerably more difficult to portray as mere coincidences. Unless one is very religious indeed.

History sure has a way of repeating itself. Just a few centuries ago the upholders of the establishment version of the past assured us that fossils were proof of Noah's Flood. Today they assure us that all hominids before Africa's Eve were sub-human creatures, mute carrion scavengers, brutes earmarked for extinction by that glorious race of our ancestors. Feliks grants these primitive brutes the ability to recognise the connection between some fossils and their living counterparts, and to cognitively benefit from that insight. I think other factors may have been involved in this as well, but fossils certainly had an impact on how hominids related to the physical world. That much Feliks has demonstrated.

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RAR 15-459

Sermons in stones: fossils and the evolution of representational art

By JOHN L. BRADSHAW

Feliks's thesis can be summarised as 'the prior awareness of the iconic nature of fossils primed the capacity for the mental projection of human forms into oddly shaped stones', and that 'human beings developed their own forms of image-making after exposure to natural imagery'. It is a seductive hypothesis, which, to be scientific, must be falsifiable, and I offer these criticisms as devil's advocate to further debate. I note, however, that elsewhere Feliks does acknowledge that human image making may have had many unrelated origins, and that it may have occurred independently, in many different places at different times (perhaps, I might add, like the 'invention' of pottery, cultivation, animal domestica-

tion ...).

Apparent instances of art may really subserve some other utilitarian purpose (boundary marking, recording life events, an 'I-was-here' presence); true art (i.e. for its own sake) is a nonutilitarian phenomenon which may offer a window to the psyche, reflecting the play of a disengaged intellect (Bradshaw 1997, in press). We may not be the only species to engage in such behaviour. Captive capuchin monkeys, given clay, will mould it into odd-shaped balls, and decorate them with paint and leaves; then, like children, they lose interest, suggesting that, as perhaps with latter-day rock art, the interest lies more with the action than with the product (Barnett 1997; Westergaard and Suomi 1997). From our aesthetic viewpoint, there is a range of abilities. Lenain (1995) notes apes' capacities for introducing variations that appear formally relevant and aesthetic, their sense of order, their evidence of form, rhythmicity, colour and balance, and their taste for colour contrasts. Similarly, Boysen, Berntson and Prentice (1987) note that chimpanzees do not mark randomly, but attend to the boundaries of the paper and of pre-drawn squares. Clearly at least five million years ago, with our common ancestors, the seeds were germinating of an aesthetic sense.

Fossils are eminently collectable, and Feliks offers a scholarly review of such manuports or *objets trouvés* from Acheulian times. We are not, however, unique in collecting objects on the basis of their visual properties; bower birds of various species collect a range of objects for display, though viewed in the light of mate attraction the behaviour is not nonutilitarian. I agree that 'the mysteriously fascinating and aesthetically appealing shapes and patterns which are fossils' make them eminently collectable, and that maybe only hominids noticed this, and sought to collect them. Collecting is another pre-eminently human nonadaptive drive (like hobbies generally) which is not necessarily founded in aesthetics. Indeed as an addictive, compulsive behaviour it is likely to be driven by dopaminergic mechanisms in the limbic and orbitofrontal cortex (Hollander and Stein 1997; Marazzati and Olivier 1994) and, when pathological (and even when not), to be reduced or abolished by dopamine antagonists.

Fossil collecting may inform on a capacity for perceptual organisation, object categorisation, curiosity, or an emerging sense of the aesthetic, but I am not sure how much it tells us about the expressive, productive side of representational art. Fossils may have provided templates for an iconography, but I doubt whether they were prime movers. Why not other patterns in nature, tracks in the sand (or even 'doodlings' in the dust — another nonutilitarian human drive manifesting today as graffiti 'ornamentation' of an otherwise plain surface).

I can see the likely importance of fossils in personal ornamentation (they are by their very nature pre-eminently durable) from early times though, there again, they may also (instead?) have served as a badge, marker or identifier. They may also have played a role in the evolution of certain forms of rock art, without necessarily relating in any obvious way to pigmentary art or skin adornment, both of which are of course far less durable in the archaeological record.

The natural world abounds with other objects (shells, nuts, leaves and flowers) and it is not clear why we need to invoke fossils, except to introduce the concept of *substitution*; and, again, while fossils may be locally abundant, there are other, more-widespread instances of substitution in nature, e.g. tracks in the sand, and shadows as Feliks himself acknowledges.

I agree that there may be a very fine line (and a vexed problem of interpretation) between what is 'nonrepresentational' (lines, arcs, zigzags, spirals, simple geometrical figures) and what *could* be representational. We do not *know* that the scrawlings of an ape or the unskilled scribblings of an infant are not meant to be representational. Conversely Feliks's intriguing parallels between 'enigmatic prehistoric artworks and representations of various fossil phyla' (Figures 3-5, which, incidentally are mostly dated to 17 000 years ago or later), may be dangerously close to the statistical problem of a Type 1 Error — seeing a significant effect (here, a correlation), which is really due to chance. There are after all only a limited number of ways to employ simple contours. Again, from the standpoint of a devil's advocate, one *could* argue that the Berekhat Ram and Makapansgat objects are bound eventually to turn up, by chance, if enough sites are studied; coincidences are always appealing, especially where there may be little or no evidence (or possibility) of deliberate modification. Indeed Noble and Davidson once suggested to me that the centrality and symmetry (so elegantly demonstrated by Feliks) of the iconic image (fossil) in the Acheulian handaxes may merely be a consequence of the physical properties of the medium when constructing a tool.

I agree with Feliks in dismissing the Lewis-Williams entoptic hallucinations/shamanistic trances explanation which as a neuroscientist I have always found implausible compared to other more probable accounts (including Feliks's). Similarly, it is unsurprising that infrahuman species 'can recognise iconic images depicted in ... line drawings', as the mammalian visual system, from retina to association (inferotemporal) cortex, has a common architecture which is particularly sensitive to contour. It is by contours that real objects are largely recognised, as demonstrated by electrophysiological studies in animals, and cases of visual agnosia in humans (Bradshaw and Mattingley 1995).

Finally, Feliks invokes cryptomnesia as an explanation of fossils unconsciously influencing iconography; it is noteworthy that tacit or implicit (i.e. consciously inaccessible) influences are now known to pervade all aspects of human information processing, including object recognition, skilled manual praxis, speech, reading, space-related behaviours and so on (Bradshaw and Mattingley 1995).

Feliks is to be congratulated on a stimulating new hypothesis for a perennially interesting issue.

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RAR 15-460

Fossils, art and ritual: a comment on Feliks

By ELERY HAMILTON-SMITH

John Feliks has made a significant contribution to discussion about the evolution of rock art. His paper is a convincing one, particularly in pointing to similarities of detail between fossils and human representations on a regional basis. But it also demonstrates a very plausible and intuitive hypothesis: after all, copying of other images or two-dimensional forms is a very common starting point for children's drawings.

Although not mentioned in the Feliks paper, there seems to be an interesting parallel with the ritual placement of sub-fossils. Recent investigations in the remarkable Altar Cave and some others in the same region of Romania have revealed a number of groups of sub-fossil cave bear (*Ursus spelaeus*) skulls placed in ritualised patterns on the cave floor (Lascu 1996).These have been dated, generally from the calcite encrustation covering them, at between 40 000 and 75 000 BP. They are not uncommonly accompanied by fragments of flint and lumps of red ochre.

Although claimed to provide evidence of early religious ritual, one might also assume that the skulls left over from eating were simply placed in patterns pleasing to the eye, rather than scattered at random. Irrespective of the motivation, these remarkable patterns certainly have an artistic dimension and might well be seen as precursors of three-dimensional representation, using readily available materials, just as the people who drew trilobites were copying readily available images.

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Anything goes, or why I personally avoid too much speculation on Palaeolithic rock art origins or 'meaning'

By LAWRENCE GUY STRAUS

The article by Feliks on 'The impact of fossils on the development of visual representation' is an interesting — even intriguing — and often plausible-sounding, but ultimately speculative piece of work, like so many writings on the origins and meaning of rock art over the last century. It is divided into three distinct parts, held together by the author's focus on fossils. The work follows the lead of Oakley, as well as of Taborin, White and others. It is well referenced and convincingly argued — like many another plausible, yet single-minded cases that have come before it in the fascinating, but scientifically 'open-ended' worlds of human evolutionary cognition study and rock art explanation. One is left at the conclusion of this piece with the question, 'Well yes, that sounds reasonable, but how could one ever prove it?' Beyond anecdotal correlative material (which might or might not amount to coincidences), there is neither real proof nor much hope thereof. As such, Feliks' piece joins a long list of supposedly over-arching explanations, from hunting magic, to shamanism (and shamanism redux), totemism, fertility magic, information theory and entoptic phenomena. While perception and, ultimately, copying of fossils, *might* be PART of the story, that story is undoubtedly far more complex.

I have no quarrel with the notion that Middle and Lower Palaeolithic hominids may have occasionally perceived fossils and made the cognitive connection with living plants or animals (perhaps doing better than some 'Enlightenment' Age Europeans), I fail to see the relevance to the explanation of Upper Palaeolithic art, tens or hundreds of thousands of years later. If Australopithecines and early *Homo* somehow understood fossils to be representations of once-living things in stone, they failed to act on this perception by way of making their own permanent representations, unless one accepts the Makapansgat and Berekhat Ram stones as such — something which, in my opinion, requires considerable leaps of faith. This is equally true of the whole first part of the Feliks article, in which the conditional tense is frequently used — and rightly so.

That fossils have been frequently collected by Palaeolithic people is a well-known fact; that hominids equated them with living seashells is certainly likely. But I have a few quibbles with such statements as fossils being transported 'possibly thousands of miles' and with lumping the whole of the Palaeolithic together in that same sentence (see p. 79). There is certainly considerable evidence of transport (no doubt through a combination of human trips and down-the-line exchanges) of fossils (and shells) over hundreds of kilometres, but this is mainly an Upper Palaeolithic phenomenon. I am also troubled by a blanket condemnation of 'less exacting excavation techniques applied to cave sites' (Footnote 6); Edouard Dupont (1873) found large numbers of fossils in his 1860s excavations in the caves of Belgium, just as we found a few more (also from the Paris and Loire Basins) in our recent excavation of La Grotte du Bois Laiterie (Otte and Straus 1997). On the contrary, fossils may now be absent from many open-air sites in loess deposits because of unfavourable preservation conditions (P. Vermeersch, pers. comm.). Feliks' comment that archaeologists have supposedly missed fossils in caves more than in open-air sites is simply gratuitous.

Statements such as 'the scallop image holds a special attraction for human beings, both prehistoric and modern', really give pause, at least to me. Is Feliks really arguing for some-pan hominid symbol system stretching from Acheulean Norfolk to Santiago de Compostela at the end of the second Christian millennium?

To be sure, Aurignacian people liked fossils and similarly-shaped modern seashells (and even made facsimiles thereof, as demonstrated by R. White), but I am not clear as to why one needs a 'natural substitutions theory' in that period. By 32-30 kya, Aurignacian-age people were painting the magnificent ungulates and carnivores of La Grotte Chauvet (Clottes et al. 1995). I would also note that the early Aurignacian deposit which yielded the ivory figurines of mammoth, bear, bison and anthropomorph, has now been redated by AMS, yielding an age of around 37 000 radiocarbon years ago (Hahn 1995). So the 'gastropod sculptures' do not predate full-fledged representations of mammals and people.

Feliks states that art images not depicting animals or humans are 'traditionally referred to as "abstract signs", "non-figuratives", or simply, "non-representational geometric patterns".' While such descriptions are indeed often given, Feliks forgets that from the earliest days of cave art interpretation, a wide variety of *representational* explanations has been suggested, including tectiforms, claviforms, scutiforms, naviforms etc. (see Bahn 1997: 167). Totemic signs, spirit houses, fences, ladders, nets, traps, weirs, arrows, stylised hands, and notational devices have been among the explanations that have also been floated from time to time for various of the painted, drawn and engraved 'signs' of the European Upper Palaeolithic (see Ucko and Rosenfeld 1967). So, why not fossils? Stating that, 'The popular claim that "abstract signs" have no readily visible counterparts in the physical world ...', especially without any citation, smacks of a 'straw man' argument with the *dénouement* being none other than ... (surprise!) fossils.

Feliks accounts for inaccuracies in the supposed prehistoric representation of fossils by stating that it is 'doubtful that any prehistoric artist would have portrayed what he saw in the anatomically accurate style of a scientific illustrator'. Perhaps ... but many Upper Palaeolithic representations of *large mammals, birds and fish* — beginning with Chauvet — are extraordinarily 'accurate', keeping in mind that scientific illustrators do not produce photographic images; even they do *interpretations* of what they have seen.

While no fan of David Lewis-Williams' entoptic explanation, I see no reason for accepting fossils as any more plausible a source for many 'signs', although Feliks does bring forth some very interesting comparisons. The fact that trilobites may not be at the top of prehistorians' 'hit parade' of favourite animals, seems to be a rather weak (again 'straw man') argument for no one having proposed this universalistic explanation before. Having seen post-Palaeolithic figures at Esperança (Portuguese Alentejo) like some of those depicted by Feliks from Spanish Extremadura and La Mancha, I can vouch for a vague similarity to trilobites. Yet many other possibilities exist and indeed have been suggested by Iberian prehistorians. One person's plausibility is another's absurdity in these circumstances. Feliks is bold in his speculations; they include some plausible insights, but at best they remain simply such, at least in my stones-and-bones archaeological mind.

Among various minor orthographical errors in the article is one close to heart. In footnote 17, 'Albuquerque' is given the Portuguese spelling; yet this city has been in the Spanish province of Badajoz for centuries and is spelled 'Alburquerque', as was my city in New Mexico until a spelling mistake was made in the 19th century during the 'Anglo' onslaught.

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RAR 15-462

REPLY

The value of interpretive approaches in archaeology

By JOHN FELIKS

I wish to thank the scholars who provided these primarily supportive, insightful and constructive Comments. It must be stated up front, however, that *The impact of fossils* was running against the deadline — I received the first round of *RAR* Comments just prior to this November issue going to press. Given these circumstances, I was unable to write a more systematic, point by point reply.

Concerning the 'natural representations theory'

I am pleased that each of the commentators appears open to the idea that prehistoric people may have benefited from an awareness of fossils. Bednarik's positive words concerning the invention of a referent via fossils, and his nautical evidence supporting likely symbolic capacities in Acheulians (the earliest people known to have collected fossils) is most appreciated, as are Bradshaw's thought-provoking perspectives on the collectability of fossils, and related issues. Although the bear skull arrangements cited by Hamilton-Smith are not directly related to the subject of fossil collecting, they are, nonetheless, additional evidence for symbolic or aesthetic capacities in pre-Aurignacian people. As pointed out in the paper, there are numerous examples of fossil collecting during the Middle Palaeolithic.

As to Bradshaw's question, why invoke fossils when the natural world 'abounds with other objects', I would reiterate that unlike other natural objects, fossils could

have taught prehistoric people the crucial lesson that iconic images of living things can exist in non-living solid materials; and that fossils, being pre-existing images on rock surfaces, could have spurred the motivation to create images on rock surfaces. Bradshaw rightly points out that there are other, 'more-widespread' instances of substitution in nature (e.g. shadows, tracks). But collected fossils found in association with similar contemporary shells collected from active beaches represent the earliest archaeological evidence that Palaeolithic people employed substitution. We have yet to discover any Palaeolithic shadows in situ. But, in all fairness, I will concede that synecdochical substitutions were, probably, already long-understood and used by the time Aurignacians made necklaces consisting of both fossil and contemporary shells side by side.

Concerning the West Tofts handaxe

Both Bednarik and Bradshaw mention that some scholars question whether the centrality of the fossil in the West Tofts handaxe was the result of human intention. However, even though my geometric studies lend support to the 'deliberate design' interpretation, with the 'natural representations theory', the fossil's centrality is no longer the primary issue; the most profound implication of the fossil, now, is its iconic nature. The fact that an iconic image of a scallop shell was observed and probably recognised as a scallop shell by an Acheulian toolmaker (and all of his or her family and friends) is significant in matters relating to early iconic recognition and symbolic capacities.

Concerning the 'fossil depictions theory'

Although eliciting much positive response by way of its side by side visual comparisons, the 'fossil depictions theory' has attracted an equal amount of criticism primarily due to its being non-refutable. It should not, however, be dismissed altogether, as Bednarik seems ready to do. At the very least, it has value in its ability to encourage a closer look at 'abstract signs' from a regional perspective. I appreciate Hamilton-Smith's comment essentially to this end.

Further, as noted in my paper's introduction (and which Bradshaw kindly reiterates and expounds upon in his Comment), the 'archaeological record' *as we know it* suggests that image making had many unrelated origins, beginning and ending again and again, and in many different geographic locations. Unless we propose some kind of artistic continuity from the very first Palaeolithic image through to the most recent modern image, it is feasible that some *first attempts* at rock art depiction could have been prompted by particular, perhaps 'eye-catching' fossils. And, just as parietal rock art is still observable at the locations where it was initially produced, perhaps, also, fossil referents. What other palaeoart interpretations offer even the *possibility* of a still-surviving referent? The 'fossil depictions theory', therefore, is useful, and warrants further exploration and development; it certainly calls for more attention to palaeontological contexts in regional investigations.

Response specific to Straus

Straus expresses unnecessary concern at my citing Hahn (1972: 260) regarding the less exacting techniques applied to cave sites as compared to open-air sites; this was Hahn's assertion, not mine. Neither did I say that there were *no* carefully excavated cave sites. In fact, the fossils that Otte and Straus discovered in their recent (and, no doubt, thorough) excavation of La Grotte du Bois Laiterie may add grist to my mill. Also, Straus' comment that 'fossils may now be absent from many open-air sites in loess deposits because of unfavourable preservation conditions' (not inadequate excavation techniques, mind you) adds hypothetical support to my assertion in Footnote 6 that prehistoric people undoubtedly collected many more fossils than are known from the 'archaeological record'.

Straus was correct in reminding me that various 'non-figuratives' have, in the past, enjoyed many representational interpretations, and that fossils are but another.

Finally, I understand the reasoning behind Straus' (and Bednarik's) generic criticism that so many writings on the origins and meaning of prehistoric rock art are, ultimately, speculative. But isn't this the *true* 'nature of the beast'? I suppose it all goes back to the debate about whether archaeology, in general (and palaeoart studies, in particular), should even attempt to be 'scientific' by modern definitions. Certainly, archaeology diminishes itself when asserting that the only valid contributions are those which are 'testable'. I, personally, would take much less interest in the discipline if it restricted itself to rigid scientific methodologies, and gave no admission to interpretive approaches.

In defence of speculative writings I would point out that, unlike various physical and social sciences which are replete with a never-ending supply of materials (or subjects) for study and *easy* employment of the scientific method, palaeoart studies often depend upon extremely sparse physical evidence. Consequently, in the quest to gain a greater understanding of our ancient predecessors as once-living and thinking, creative human beings we must study ever more closely (often microscopically), repeatedly, and more open-mindedly the few artefacts and other evidences which are presently available. Speculation and 'plausible insights' are a natural and valuable part of this process, as is the chain of insights created when an 'untestable' theory inspires other theories — testable or untestable.

RAR 15-463

Résumé. *La délibération des origines de la représentation visuelle a essentiellement été à propos de l'activité et de la psychologie humaine. Cet article propose que la représentation artificielle était précédé par un système de représentation naturelle déjà bien perfectionné, dont les produits étaient observés et retenus par l'homme primitif. L'auteur suggère les nouvelles hypothèses suivantes: (1) Les fossiles servaient de moyens par*

lesquelles les êtres humains ont commencé à comprendre les concepts de 'l'imagerie' et de 'la substitution' avant *la création d'images artificielles. (2) Les hommes ont développé leurs genres uniques de représentation visuelle iconique (particulièrement en ce qui concerne la roche), ayant été informés a priori de différentes possibilités par les fossiles. (3) Beaucoup de pièces d'art pré-Historiques inexpliquées pourraient être des représentations de fossiles structurellement et proportionnellement exactes. Les hypothèses ont une validité inter-culturelle étant donné que les fossiles ont une distribution universelle. Les études cliniques présentent le potentiel d'évaluation par analogie.*

Zusammenfassung. *Die Ursprünge visueller Darstellung sind in erster Linie in Beziehung auf menschliche Aktivitäten und Psychologie besprochen worden. Dieser Artikel schlägt vor, daß es vor menschlich-hergestellter Darstellung schon ein natürliches, durchaus perfektes Darstellungs-System gab, dessen Erscheinungsformen vom Frühmenschen bemerkt und gesammelt wurden. Der Autor legt die folgenden neuen Hypothesen vor: (1) Fossilien waren ein Mittel, durch das Menschen die Begriffe "Bildnis" und "Substitution"* vor *der Erschaffung menschlich-hergestellter Bilder erlangten. (2) Menschen entwickelten ihre eigenen Formen ikonischer visueller Darstellung (besonders solche auf Fels-Medien), nachdem sie erst durch Fossilien auf gewisse Möglichkeiten aufmerksam wurden. (3) Viele unerklärte vor-geschichtliche Kunstwerke könnten strukturell und proportionell genaue Abbilder von Fossilien sein. Nachdem Fossilien in der ganzen Welt bekannt sind, haben die Hypothesen zwischen-kulturelle Gültigkeit. Klinische Studien bieten die Möglichkeit analoger Testfähigkeit.*

Resumen. *Los orígenes de la representación visual han sido debatidos principalmente en términos de actividad humana y psicología. Este artículo propone que las representaciones hechas por el hombre fueron precedidas por un sistema representativo natural, ya bastante perfeccionado, cuyos productos eran observados y recolectados por los humanos tempranos. El autor sugiere las siguientes nuevas hipótesis: (1) Los fósiles fueron un medio por el cual los seres humanos llegaron a comprender los conceptos de 'imágenes' y 'substitución'* antes *de la ceación de imágenes hechas por el hombre. (2) Los humanos desarrollaron sus propias formas de representación icónica visual (especialmente aquellas en el medio roca), habiendo primero llegado a tener conciencia de varias posibilidades por medio de los fósiles. (3) Muchos trabajos pre-históricos de arte inexplicados podrían ser representaciones estructural y proporcionalmente precisas de fósiles. Debido a que los fósiles son conocidos en todo el mundo, las hipótesis tienen una validez cultural a nivel internacional. Estudios clínicos ofrecen la posibilidad de una verificación analógica.*

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RAR DEBATES

Comment on
POSSIBLE REPRESENTATIONS OF PALAEOLITHIC FISH-TRAPS IN UPPER EGYPTIAN ROCK ART
By Dirk Huyge
In *Rock Art Research* 1998, Vol. 15, No. 1, pp 3-11.

FURTHER COMMENT

Fishing in the Sahara

By BARBARA E. BARICH

In this article the author raises a challenging topic: why ever are the activities related to fishing so under-represented in the Saharan iconography?

We know that fishing and the exploitation of aquatic resources played an important role from the end of the Pleistocene, throughout the Holocene, both in the Nile Valley and in the Sahara. The impact this phenomenon had, and its role in leading to more 'modern' economic activities, became increasingly evident as research progressed in the Saharan-Sahelian zone. In the light of this it is quite surprising that the rock art repertoire very rarely makes reference to fish and fishing. Among the most famous examples known to date we can cite the Sefar '*grand dieu pêcheur*'; some fish from the Wadi Djerat; and some 'ichthyomorphic' figures recorded in the Acacus. Three of them were recorded in the Wadi Auis, not far from the Ti-n-Torha East site. As it is well known, fish exploitation evidence was uncovered from this site.

Therefore, Huyge's identification of the 'enigmatic' figures from El-Hosh as fish-traps seems quite convincing. However, an autochthon tradition of such devices — although reported by the classical authors — does not seem to be well-documented in the local ethnographic traditions. In fact, we know the importance of the ethnographic sphere for understanding meanings — relative to the material and non-material elements of culture — which alone are not identifiable.

As far as the age suggested by Huyge is concerned, the long tradition of fishing activity on the Nile could in my opinion prevent a more precise chronology. Indeed, it is true that the earliest certain evidence of fishing goes back to Late Palaeolithic contexts (we can cite Wadi Kubbaniya) but it continues up to Neolithic and pre-Dynastic times. As regards dating, the superimposition issue, properly advocated by Huyge, is probably the most convincing. It is more valid than the deductions derived from the 'antiquity' of the patina which, lacking direct dating evidence (until now quite difficult to obtain), are in my view not a decisive proof.

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REPLY

'Where are the fish?': piscatorial representations in central Saharan and Egyptian rock art

By DIRK HUYGE

The interesting topic raised in the above comment has barely been touched upon in my article on Palaeolithic fish-traps in Upper Egyptian rock art and certainly deserves a more exhaustive reply. Professor Barich is absolutely right stating that fishing and the exploitation of aquatic resources were important economic activities throughout the Late Pleistocene and the Holocene, both in the central Sahara and in the Nile Valley. Various types of documents attest to this. Fish remains abound in central Saharan and Egyptian Quaternary sites. A synopsis of data on Holocene fossils available in the literature has been compiled by W. Van Neer (1989: Fig. 3). In the central Sahara, fish bones have been recovered in their hundreds at, among other Neolithic sites, Meniet (Tidikelt), Amekni (Hoggar) and Ti-n-Torha (Acacus). Moreover, different types of fishing gear (fishhooks, harpoons and other tackle) have been identified in the Saharan archaeological record (for an overview, see Leclant and Huard 1980: 288-91, Fig. 106). The Nile Valley archaeozoological, iconographic and archaeological evidence in this respect is overwhelming. Fish and fishing in Egypt are the subject of an extensive body of literature (see bibliography in, amongst others, Brewer and Friedman 1989; van Elsbergen 1997; Sahrhage 1998).

The rock art contrasts with this evidence through its paucity of relevant depictions. Basically three types of rock art documents regarding fish and fishing can be discerned: (1) apparent representations of fish; (2) apparent representations of fishing equipment; (3) representations of pisciform (or 'ichthyomorphic') human figures. Let us consider each of these categories separately.

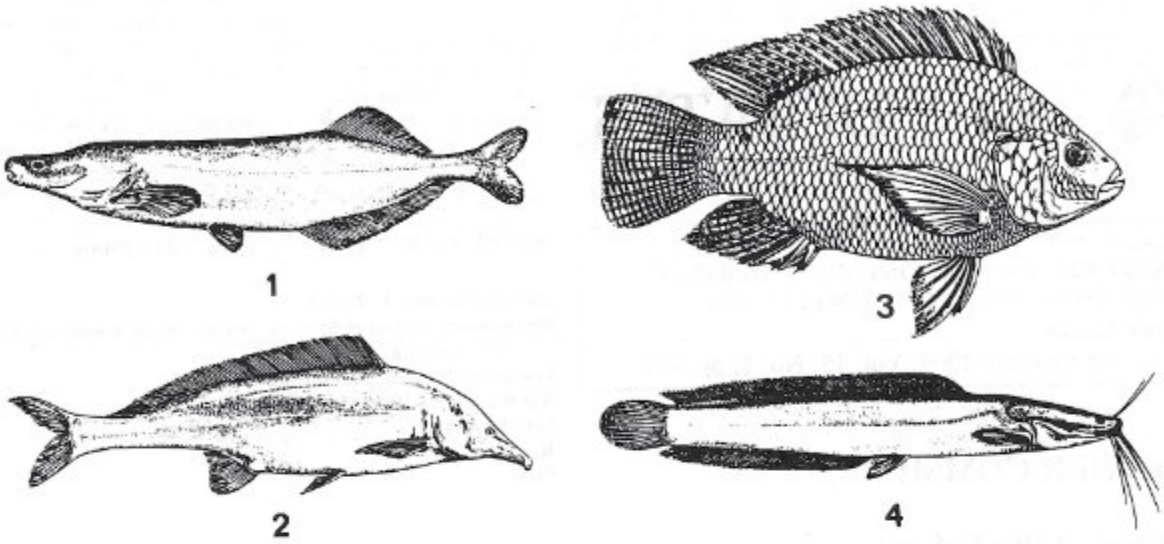

Figure 1. Some fish species 'identified' in central Saharan and Egyptian rock art: 1. Mormyrops anguilloides*; 2.* Mormyrus caschive*; 3.* Tilapia nilotica = Oreochromis niloticus*; 4.* Clarias gariepinus *(after von den Driesch 1986).*

1. Fish

Representations of fish (see Figure 1) occur at a number of sites in both the rock art of the central Sahara and the Nile Valley. The following preliminary catalogue has been compiled on the basis of a cursory reading of the literature and information kindly provided by colleagues (and is probably very incomplete):

Central Sahara

1. Auis, Acacus (Barich 1987: 111, Fig. 5.7a): three schematic fish(?) petroglyphs.
2. Iddo-Tissoukal, Tassili (Breuil 1954: 20, Fig. 22a): fish(?) painting.
3. In-Djerane, Tassili (Serpion 1994: 89): fish petroglyph. 'Naturalistic Bubaline' ('Large Wild Fauna') style.
4. Jabbaren, Tassili (Breuil 1954: 20, Fig. 28; Muzzolini 1995: 237-8, Figs 215-6): fish(?) painting. 'Round Head' ('Martian') style. Breuil's identification seems plausible to me; Muzzolini questions its correctness.
5. Messak, Fezzan (Van Albada and Van Albada 1994: 44; Le Quellec 1998: 110-2, Fig. 34): very rare fish petroglyphs. One of these, at Imrawen, has been identified by Le Quellec as *Hemichromis* sp.; another one, near I-n-Galgiwen, as tilapia (Tilapiini).
6. Ouan Serchamar, Tassili (Serpion 1994: Pl. F): three fish paintings. 'Round Head' ('Martian') style. Two of these have been identified as tilapia (Tilapiini).
7. Oued Djerat, Tassili (Lhote 1975-1976: 176-7, Nos 650-2, Fig. 15): three fish petroglyphs at Station XVII (see Figure 2). 'Naturalistic Bubaline' ('Large Wild Fauna') style. Probably correctly identified by Lhote (1975-1976, 786) as '*Mormyre du Niger et du Tchad*' (*Mormyrops anguilloides*?). According to Serpion (1994: 89), fish have been found at three locations in the Oued Djerat: three grouped fish (Lhote's Nos 650-2) are tilapia (Tilapiini) (highly unlikely), another perch (*Lates* sp.), and still another, shown from above, might be catfish (*Clarias* sp.; possibly *Clarias gariepinus*). The latter is probably the fish represented in Figure 3 (drawing after an original photograph provided by Prof. Dr J. Mertens of the University of Ghent, Belgium).

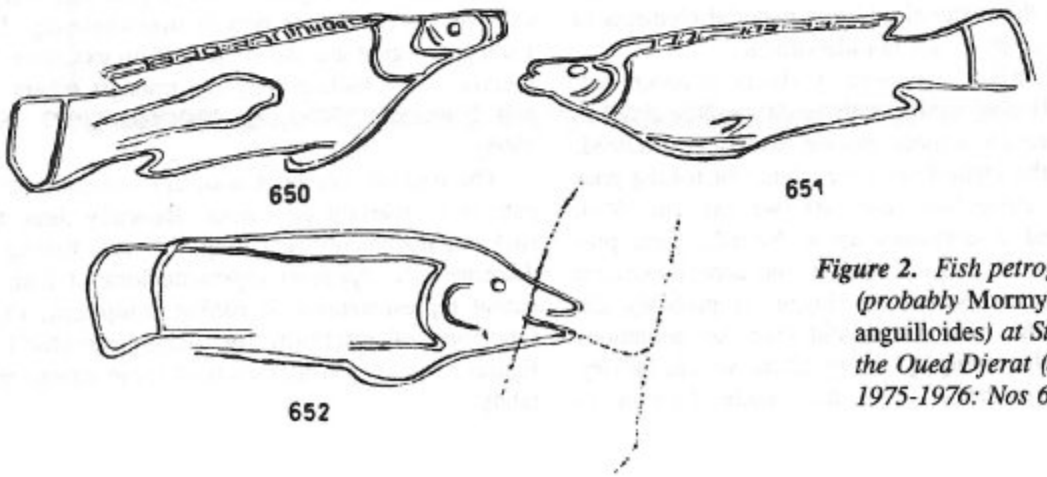

Figure 2. Fish petroglyphs (probably Mormyrops anguilloides*) at Station XVII in the Oued Djerat (after Lhote 1975-1976: Nos 650-2).*

Figure 3. Fish petroglyph (probably Clarias gariepinus*) in the Oued Djerat (after a photograph provided by Prof. Dr J. Mertens of the University of Ghent; drawing by F. Roloux).*

8. Sebha, Fezzan (Corrain et al. 1969: 81, Pl. I,H and I): two(?) fish drawings (one fragmentary).
9. Sefar, Tassili (Serpion 1994: 89): two fish paintings. 'Round Head' style.
10. Southern Tadrart (Allard-Huard 1984): some fish petroglyphs. Pastoral phase.
11. Tahouilet, Tassili (Diolé 1955: 81, Pl. VI): fish painting. Identified by Serpion (1994: 89) as tilapia (Tilapiini).
12. Ti-n-Bedjedj, Tassili (Breuil 1954: 20, Fig. 22c): fish(?) painting.
13. Ti-n-Moussa, Tassili (Muzzolini 1989: 41, Fig. 2, 10): two or three fish paintings. Iheren-Tahilahi style.
14. Ti-n-Rassoutine, Tassili (Breuil 1954: 20, Fig. 22b): fish(?) painting.
15. Ti-n-Teferiest, Tassili (Serpion 1994: 89): fish painting. 'Round Head' style.

The '*grand dieu pêcheur*' ('great fisherman god') of Sefar, Tassili, referred to by Barich in her Comment, does not seem to have any relationship to fish or fishing (cf. Muzzolini 1995: 235-6, Fig. 171).

Egypt

Apart from a number of fish representations in an evidently Christian-Coptic symbolic context (see e.g. Winkler 1939: Pl. VII,2; Červíček 1974: Fig. 446; Červíček 1986: Photo 8, Fig. 78), fish figures have been discovered at the following rock art sites:

1. El-Hosh, Nile Valley (Červíček 1974: 172, Fig. 141): fish petroglyph. Predynastic period(?). Identified as elephant-snout fish (*Mormyrus* sp.; possibly *Mormyrus caschive*).
2. Elkab, Nile Valley (Huyge 1995: 149, Pl. 117, A-B): two fish petroglyphs at Site 64 (see Figure 4). Late Predynastic (?) period. Identified as tilapia (Tilapiini) (possibly *Tilapia nilotica* = *Oreochromis niloticus*).

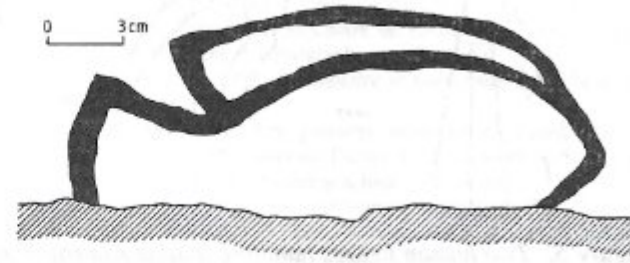

Figure 4. Fish petroglyph (probably Tilapia nilotica = Oreochromis niloticus*) at Site 64 in Elkab (after Huyge 1995: Pl. 117B).*

3. Gebel Teir, Kharga Oasis, Western Desert (Fakhry 1951: 419-20, Fig. 41, Pl. IV, B): fish petroglyph. Graeco-Roman period.
4. Gebel Tjauty, Theban Western Desert: (a) Gr. No. 2 (Darnell and Darnell 1996-1997: 71, Fig. 13; Friedman 1999): three fish petroglyphs. Terminal Predynastic period. Tentatively identified by Friedman as elephant-snout fish (*Mormyrus* sp.), Nile perch (*Lates niloticus*), and carp (*Barbus bynni*) or mullet (*Mugil* sp.); (b) Gr. No. 33 (Darnell and Darnell 1999): fish petroglyph. Pharaonic period. Identified as tilapia (Tilapiini); (c) un-numbered graffito (Darnell and Darnell, pers. comm.): four fish petroglyphs. Pharaonic(?) period. Identified as tilapia (Tilapiini).
5. Kagug-Shibeika, Nile Valley (Červíček 1974: 172-3, Fig. 246): fish petroglyph. Identified as tilapia (Tilapiini).
6. Unnamed site, Theban Western Desert (J. C. Darnell and D. Darnell, pers. comm.): fish petroglyph. Pharaonic period. Identified as carp (*Barbus bynni*).
7. Wadi el-Hol, Theban Western Desert (Darnell, forthcoming): (a) Section B: two fish petroglyphs; (b) Section C: 12 fish petroglyphs. Pharaonic(?) period. Eleven of these have been 'identified' as tilapia (Tilapiini).
8. Wadi Hammamat, Eastern Desert (Bernand 1972: Pl. 17,2, 18,2): fish petroglyph. Graeco-Roman period.

2. Fishing equipment

Representations of possible fishing devices are scarce. Most peculiar are the more than life-sized representations of two 'Naturalistic Bubaline' ('Large Wild Fauna') style human figures at Station XXXI (Abeior) in the Oued Djerat, Tassili, handling triangular devices that can be 'identified' as plunge-baskets or cover-pots (Lhote 1975-1976: 514-7, Nos 1647-8, Fig. 53) (see

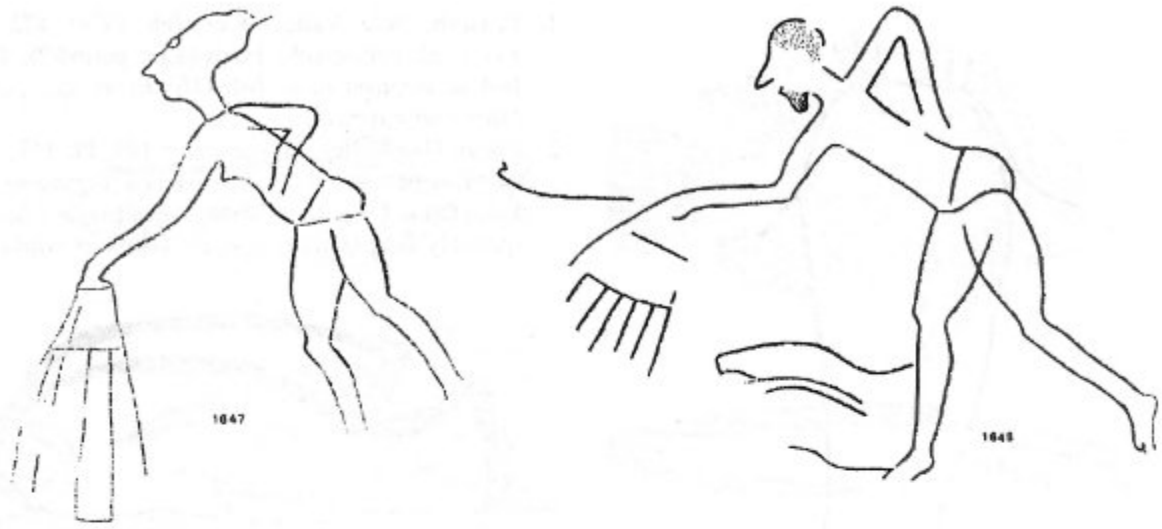

Figure 5. Two human figures handling 'basket fish-traps' at Station XXXI in the Oued Djerat (after Lhote 1975-1976: Nos 1647-1648).

Figure 5; compare with the ancient Egyptian representations and ethnographic examples of basket fish-traps in Lacau 1954; Brewer and Friedman 1989: 37-38, Figs 2.26abc, 2.27ab). Apart from the El-Hosh petroglyphs discussed in my *RAR* article (for a modern ethnographic parallel from the First Cataract area, see also Boulenger 1907: xlii-xliii, Fig. 24), also some enigmatic multiple-branched motifs in the rock art of Ti-n-Reroh, Hoggar, have tentatively been identified as labyrinth fish-traps (Huyge 1994). Probable representations of fishhooks and harpoons (fish-spears?) have been recorded at rock art sites in the vicinity of the Second Cataract in Lower Nubia (Hellström 1970: Corpus W1-14). A possible fishing scene from Ti-n-Rassoutine, Tassili, shows a 'Round Head' human figure brandishing a 'club', apparently with the intention of killing a fish(?) (Breuil 1954: 20, Fig. 22b).

3. Pisciform human figures

The only examples of this have been identified in the rock art of Ti-n-Reroh, Hoggar. A number of anthropomorphous figures bear cordiform masks or stylised faces that are possibly pisciform (see Huyge 1994). Because of their triangular shape, the position of the eyes, the presence of lateral protuberances and a 'beard' (whiskers?) in some examples, these masks or faces indeed display a remarkable likeness to heads of the air-breathing catfish *Clarias* (see Figure 6).

In conclusion we can say that, compared to many other faunal themes in the rock art of the central Sahara and the Nile Valley, fish and fishing are indeed seldom referred to. Even though some of the above examples are doubtful, it would, however, be incorrect to state that these subjects do not occur. Taking into account the fact that several of the documents listed above have been discovered or described in recent years, it is also possible that our current information on this topic is biased to some extent. Be that as it may, there is clearly no reason whatsoever to suggest that fish and fishing were the subject of an overall taboo (cf. Serpion 1994: 89). Evidently, for one reason or another, the rock artists were not particularly interested in representing these themes.

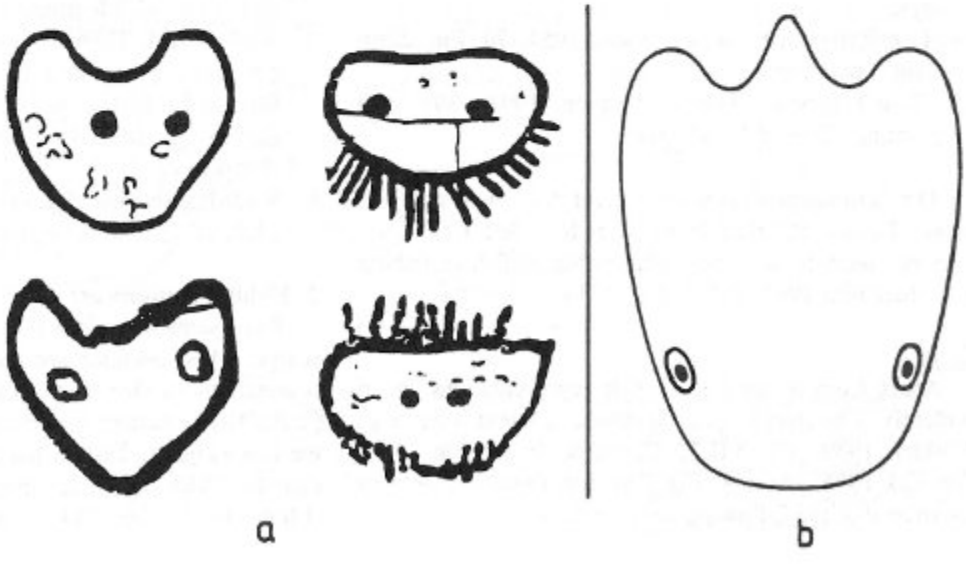

Figure 6. Selection of characteristic Ti-n-Reroh masks or faces (a) and schematic dorsal view of catfish-head (b) (after Huyge 1994: Fig. 8).

In this, fish are not an isolated case. As far as the Nile Valley is concerned, other types of animals that had a prominent part in the economy were not or almost not represented in the local petroglyph traditions (e.g. sheep, goats and pigs). Also, in central Saharan rock art, cultural filters seem to determine the choice of animals: certain species are favoured, others are excluded from the picture (see Muzzolini 1995: 79). Moreover, both in the central Sahara and in the Nile Valley, most fish do not seem to occur in evidently meaningful narrative or symbolic compositions. One may only conclude that these creatures did not play a very significant part in the 'mythico-religious' symbolism (or any other type of symbolism) sustained by the North-African rock art traditions. The curious pisciform anthropomorphous figures from Ti-n-Reroh could be the exception which proves the rule.

Acknowledgments

I am grateful to Deborah Darnell, John Darnell, Renée Friedman, Jean-Loïc Le Quellec, Johan Mertens and Wim Van Neer for generously sharing information.

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RAR 15-465

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Comment on
THE TECHNOLOGY OF PETROGLYPHS
By Robert G. Bednarik
In *Rock Art Research* 1998, Vol. 15, No. 1, pp. 23-35.

FURTHER COMMENT

Footnote on the technology of petroglyphs

By R. G. BEDNARIK

Doyen of South African rock art research, Bert Woodhouse, has drawn my attention to the work of W. Sierts in the 1960s, which I have omitted to mention in my paper on petroglyph technology. As the results of this highly relevant work may not be readily accessible to readers I will briefly summarise them here.

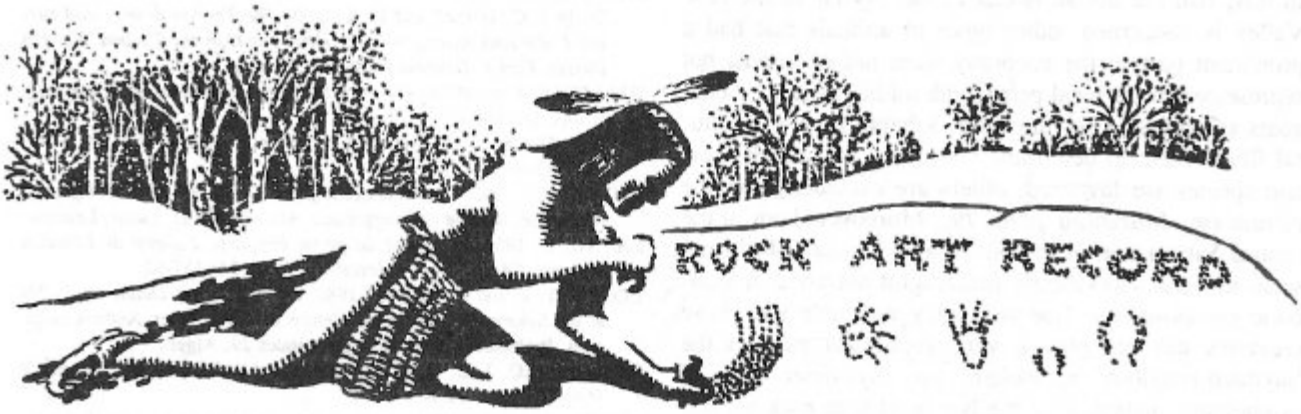

Figure 1. Two artistic reconstructions illustrating how percussion petroglyphs are falsely assumed to have been made. The upper is from Canada, the lower from Russia.

Sierts (1968) describes himself as having 'a sound knowledge and experience as a trained sculptor in a wide range of materials'. Having seen three petroglyph sites near Kimberley, South Africa, he became interested in how the pictures had been made. Unencumbered 'by any theory' he conducted replication experiments with several materials on dolerite, diabase and sandstone. He produced a few petroglyphs, timing himself and keeping records. These samples are of quite elaborate petroglyphs, including a filled-in eland figure with detailed internal markings. Sierts reports that these took substantially less time to make than his colleagues estimated, which tallies with my observations as reported in my paper. Sierts took about one hour to create three petroglyphs which others estimated to have taken him 40 to 50 hours. I have reported that simple standard petroglyphs that take one or two minutes to make are believed by colleagues to take between 15 minutes and six hours.

Sierts specifically mentions that indirect percussion (the hammer and chisel method) is 'absolutely unsuitable' in most cases:

> Even the finer peckings seem to be made with direct blows since the chisel-technique invariably causes the tool to splinter. Only diabase could be used as a chisel in a limited way. If any petroglyphs have been produced in this way, there must still be abundant evidence in suitable localities of these typical flakes and chips in the soil (possibly one could sieve at such places). (Sierts 1968: 238)

He also provides a photograph of the kind of tool flakes indirect percussion yields. His comments coincide precisely with those of other researchers who either find it highly likely, or have demonstrated, that the hammer-and-chisel method was not used in the production of percussion petroglyphs. As noted in my paper on petroglyph technology, I regard the frequent claims of archaeologists that precisely directed, deep percussion marks were made with chisels as unsupported and academic. Sierts' work confirms this view. The high standard of craftsmanship of his petroglyphs confirms that such works can be created with simple direct percussion by a skilled artisan.

R. G. Bednarik, *RAR* editor

REFERENCE

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ORIENTATION

The Third AURA Congress

The Third AURA Congress will be held in the very heart of Australia. The academic symposia are to be conducted in Alice Springs from Monday, 10 July to Friday, 14 July 2000, at the Rydges Plaza and Araluen Centre, a perfect setting for a memorable scientific and academic event. They will be preceded and followed by about one month of field trips covering the continent of Australia. The event will attract the participation of the world's 500-600 foremost scholars in the fields of rock art research, palaeoart studies and cognitive archaeology.

This event will be held under the auspices of the Australian Rock Art Research Association (AURA). It has been nominated as International Rock Art Congress (IRAC) by the International Federation of Rock Art Organizations, which consists of 31 organisations like AURA, collectively representing all researchers in this field. The AURA Congress will include the Annual Business Meeting of IFRAO and other special events, such as the General Meeting of AURA.

The Congress will encourage the participation of Australian and overseas indigenous scholars, artists and site custodians. Every effort will be made to involve particularly the Aboriginal communities of central Australia. This program is to be underwritten by several sponsors.

Academically, the AURA Congress has established a world-wide reputation of excellence. The theme of AURA 2000 will be

Millennium: a fresh start

and the symposium topics will be appropriately innovative and forward-looking. So will be the technology, it is planned to broadcast the congress proceedings and debates live on the World Wide Web. All academic presentations will be published subsequently, as have been those of the two previous AURA Congresses (Darwin 1988 and Cairns 1992).

Some of the symposia at the Third AURA Congress
Alice Springs, Australia, 10 July - 14 July 2000

Rock art and ecological knowledge
Paul Faulstich, Paul Taçon and David Bennett

This symposium will provide a forum through which we can investigate the ecological priorities and concepts of various peoples as illuminated through rock art. It will attempt to understand human perceptions of nature through exploration of graphic, expressive culture. Ecological knowledge includes those aspects of culture that relate to environmental concerns directly (e.g. resource exploitation) and indirectly (e.g. totemic proscriptions). Thus, ecological knowledge affects subsistence, adaptation, cosmology and aesthetics, and these things in turn affect the knowledge base. By investigating the ethnoecology of rock art, we can gain greater understanding of critical interactions between humans and the natural world.

In this symposium we will study beliefs about the relationship between humans and the natural environment as expressed through rock art, and we will explore where these cultural systems of knowing intersect and diverge. This symposium will seek insight into how

aspects of cultural ecology are expressed through the symbolic medium of rock art, and will investigate the intersection between the external world and cultural constructions of that world. It will, essentially, strive to understand the mechanisms through which the world makes cultural sense.

Traditional ecological knowledge is being lost rapidly as elders die and their cultures undergo tremendous change. Recording, understanding and appreciating this knowledge (ethno-ecology) is thus an urgent matter. To interpret traditional ecological knowledge with care and in the interest of its possessors is one goal of this symposium. It seeks, through its inquiry into rock art, to illuminate diverse cultural interactions with Nature, thereby giving us greater appreciation of the depth and scope of knowledge systems as they relate to the natural environment. Vignettes of indigenous understandings of the natural world are precious in their own right, but they also provide potential foundations for a new environmental ethic that we so urgently need.

Contrary to popular notions, indigenous peoples traditionally and significantly manipulate natural resources. Many indigenous peoples engage in a practice of participation and reciprocity with the land. Their ethics, generally, are based on cosmologies of shared identity between humans and landscape, and facilitate the maintenance of diverse resource bases. Rock art often documents and helps articulate a moral ecology, one predicated on the shared responsibility between people and the land. In most indigenous cosmologies, the human and non-human are interdependent, and ecological limits, restraints, and responsibilities are readily apparent and part of the nature of being. The norm is that indigenous cultural ecologies are based on beliefs in the intrinsic value of the land and all that it contains. Romanticised notions of traditional ecological knowledge, however, will help neither the people themselves nor the lands they inhabit, and a realistic assessment of environmental knowledge is essential for appropriate and effective conservation.

Rock art documents elements of the vast environmental knowledge of many indigenous peoples, and recent work in this area suggests the value of this knowledge in addressing contemporary socio-ecological problems and sheds light on diverse ontologies of knowledge. Indigenous perceptions of nature, as expressed through social and cultural processes (including rock art), enrich our collective environmental understanding by providing regional specificity to global issues. Likewise, the ethnoecology of rock art can benefit indigenous peoples by helping them gain greater political and economic control over their lands through claiming and exercising unique and relevant ecological knowledge. Community-based conservation techniques are not only effective strategies, but are internationally validated approaches to conservation that can bolster local resource management. Rock art can provide insight into past environmental ideologies and management practices, and can give us greater appreciation of the options available in addressing contemporary concerns.

The symposium 'Rock art and ecological knowledge' strives to increase our understanding and appreciation of the significance of environmental concerns in rock art. It explores how the physical world is the backdrop for expressive culture that relates to the interface between humans and Nature. Proposals for papers that address this central issue are solicited. We hope to solicit a diversity of approaches and case studies. While the specifics of the symposium are still being considered, it will be structured so as to facilitate dialogue and discussion; it will be participatory and may very well include some type of 'round-table' colloquy.

The main question the symposium seeks to address is: how can rock art studies shed light on diverse cultural ecologies? One approach to organising a paper around this theme that presenters may consider is to begin with this question, presenting one's data, and then returning to the question in their concluding section. Another approach would be to use a particular case study as a window onto the inquest, focusing on the ecological question throughout the paper. Presenters are asked to address the above question in insightful and creative ways.

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RAR 15-467

Dating rock art

Alan Watchman, Marian Hyman and Marvin Rowe

Papers are sought for a symposium on the dating of rock art at the third AURA Congress. As the sub-title of the Congress is 'Millennium: a fresh start' it seems appropriate that potential speakers not only look back at the history of rock art dating, but also to the future. New

ideas and approaches to the relative and absolute dating of paintings and petroglyphs are welcome. This forum will be a venue for discussing controversial issues and raising awareness about the ethics, problems and potential values of dating rock art. Paper titles and abstracts (up to 150 words long) are invited and should be submitted to one of the following:

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RAR 15-468

Epistemology and rock art research

R. G. Bednarik and K. K. Chakravarty

Epistemology explores the nature and origin of knowledge, and in the case of humans this refers to human knowledge: how was it acquired? There is no reason that human constructs of reality, including that experienced by ourselves, need to be valid definitions of the real world. Indeed, our confidence in our own world view, which might involve concepts of time and three-dimensional linear space, is misplaced, because there is no evolutionary reason to assume that the cognition of any intelligent species, such as humans, would necessarily evolve towards a better construct of reality. This is not the purpose of evolution.

Rather, human societies are likely to have developed constructs of reality, which in some way led to those held today. The only record that exists of these past conceptual artefacts is that which might be reflected in non-utilitarian residues of cultural remains, especially in rock art. In this symposium we wish to focus on the role of rock art in exploring the epistemologies of past human societies.

This is an extremely difficult pursuit, because it assumes that a contemporary intelligent organism, which barely understands the relativity of its own construct of reality, could effectively examine the constructs of previous peoples. Nevertheless, without formulating these problems we are not likely to free ourselves of the epistemological limitations imposed by our own world view, or to effectively study the manifestations of the world-views of others as reflected in rock arts.

There is a second, less sophisticated topic we wish to address in this symposium. Epistemology must also explore the nature of the data our ideas about a particular subject are derived from. The interpretation of empirical data about rock art needs to be conducted within the framework of a universal theory that expresses the relative position of any data by reference to absolutes. The universal theory about rock art, and any other discipline that deals with phenomena of the past and the processes rendering them interpretable, is metamorphology. A major factor of metamorphological procedure is taphonomic logic, the form of logic that treats evidence as systematically distorted and seeks to understand these distortions in order to introduce epistemological veracity into interpretation.

We invite papers on both of these topics. In view of the complexity of the topics we will not impose rigid time limits on presentations, and this symposium may be conducted in a workshop-like style. The lengths of papers should be commensurate with the complexity of the presenter's argument. Paper titles and abstracts (preferably of 100-150 words) are invited, and should be sent to either of these:

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RAR 15-469

News of the World II - IRAC 2000 Call for posters

Angelo Fossati and Paul Bahn

When we published the first volume of *News of the World: recent developments in rock art research* as the acts of Symposium 14D at the NEWS95 World Rock Art Congress at Turin, we were surprised by its great success among scholars and the general public alike. The aim of our symposium was to provide a general survey of the discoveries and advances in rock art studies over the previous five years. For these reasons we invited twenty-seven contributors from fifteen different parts of the world, but at the end of the symposium we realised that, on the next occasion, it would be better to create more subdivisions of some continents. So the *News of the World II* at the IRAC 2000 will cover twenty-four different regional or thematic areas, in each of which one or more scholars will present an overall summary of the discoveries of the last five years (1995-1999).

These papers will try to avoid historical introductions (as these were already included in the first volume), pet theories and skewed accounts. The texts will be in English, with concise summaries in Spanish and French if possible.

In addition to these invited contributions the News of the World II symposium invites anyone interested to send (or bring) a poster display regarding very recent (1995-1999) rock art discoveries or projects that have some archaeological relevance, avoiding general overviews since these are covered by the papers of other symposia.

The News of the World Symposium is a closed session of invited papers only, therefore this is not a 'Call for papers' but a 'Call for posters' only.

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RAR 15-470

Forthcoming events

World Archaeology Congress 4. Cape Town, South Africa, 10-14 January 1999. Theme: 'Global archaeology at the turn of the Millennium'. Contact Carolyn Ackerman, WAC4 Congress Secretariat, P.O. Box 4455053, Claremont 7735, South Africa.

Ripon 1999 International Rock Art Congress. Ripon College, Wisconsin, 23-30 May 1999. For details, see announcements in this issue. This is the principal rock art event of 1999. For information and registration, please contact Dr Jack Steinbring, Department of Anthropology, Ripon College, P.O. Box 248, Ripon, WI 54971, U.S.A.; or e-mail: *steinbringj@mac.ripon.edu*

AURA 2000: the Third AURA Congress. Alice Springs, Australia, 10-14 July 2000.

New AURA members

We have welcomed the following new members of AURA recently:

Romain Pigeaud, Orvault, France
Parks and Wildlife Commission of N.T., Alice Springs, N.T.
Serviços de Documentação da U.M., Largo do Paço, Braga, Portugal
Taís Lima, Alegrete, Brazil
Margaret Gonshor, Elsternwick, Victoria
Sallie Anderson, ANU, Canberra, A.C.T.
Anette-Susan Douglas, Westcourt, Queensland
Su Sheng, Beizong-bu Hutong, Beijing, China
Debra S Cripps, Seaford, Victoria
Marcos García Diez, Bolboa, Spain
Anne F. Bryant, Camperdown, Victoria
Dian Moncrieff, Casino, New South Wales
Cheryl Cochineas, Strathfield, New South Wales
Ingrid Ward, Townsville, Queensland
Michael P. Diplock, Oxford, United Kingdom
Mary Clare Swete Kelly, Armidale, New South Wales
Karen Everest, Toowong, Queensland
Jocelyn Hood, Willoghby, New South Wales
Alice Buhrich, Castlecrag, New South Wales
Shaun Hooper, Baulkham Hills, New South Wales
Facultad de Geografía e Historia, Vitoria, Spain
Associazione per i Popoli Minacciati, Firenze, Italy
De Deusto Univ., Birmingham, AL, U.S.A.
Dr José Miguel Ramírez, Parque Nacional Rapa Nui, Isla de Pascua, Chile
Eva M. Walderhaug, University of Bergen, Norway
Bettyann Doyle, Nambour, Queensland
Dr Andrew M. Dorse, University of Cambridge, United Kingdom
J. M. Pragnell, Eaglehawk Neck, Tasmania
Professor Andrie Meyer, University of Pretoria, South Africa
Reinaldo Morales, Jr., Richmond, VA, U.S.A.
Scott Nicol, San Antonio, TX, U.S.A.
Pontificia Universidad Católica del Perú, San Miguel, Lima, Peru
Dr Livio Dobrez, ANU, Canberra, A.C.T.
Elise J. Kamleh, Millswood, South Australia
Diana Tsoulos, West Pymble, New South Wales
Craig Robertson, Chadstone, Victoria
GIPRI, Santafé de Bogotá, D.C., Colombia
Asociación Arqueológica Viguesa, Vigo, Spain
Professor Ralph Coffman, Dorset, Vermont, U.S.A.
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Richard I. Rudgley, London, United Kingdom
Dr Margarita Díaz-Andreu, University of Durham, United Kingdom
Dr Fidelis Masao, Dar es Salaam, Tanzania
Instituto de Ciencias Antropologicas, Buenos Aires, Argentina
Colleen Glenn, Fraser, A.C.T.
William R. Weeks, Tempe, AZ, U.S.A.
Mariann Nyqvist, Varberg, Sweden
Vitterhetsakademiens Bibliotek, Stockholm, Sweden
Sue Welch, Armidale, New South Wales
Alvaro R. Martel, San Miguel de Tucumán, Argentina

IFRAO Report No. 21

CROSSING FRONTIERS

IRAC 1998, Vila Real, Portugal

In my view, IRAC 1998 was the most cordial of all the IFRAO congresses we have seen so far. It had the stamp of its charismatic architect and Secretary General all over, and no participant was left in any doubt that Mila Simões de Abreu was in charge of proceedings. This event owes its success as much to Mila's stamina as to her individualistic mien. Of course she had the enthusiastic support of her secretariat, a team of young and utterly dedicated people, but the most endearing aspects of the entire congress were clearly attributable to Mila's inimitable style. The occasional minor chaos, the disregard for pomp and pretentiousness, the vigour and candour of debate were all extensions of her own personality.

IRAC 1998 was held in the Geoscience Building of the University of Trás-os-Montes and Alto Douro (UTAD) in Vila Real, from 6 to 12 September 1998. Vila Real is a pleasant town in the mountain setting of north-eastern Portugal. The event's sense of openness, of integrity and sincerity were well in tune with the overall theme chosen for the 1998 International Rock Art Conference: *Crossing Frontiers* related not only to national or disciplinary borders, but also to symbolic and procedural frontiers, to borders erected between factions and schools of thought. The symbol chosen for this theme said a lot: the old, disused railway bridge across the mouth of the Côa river, where it joins the Douro. Even the rock art's Rubicon of the Côa can be crossed.

But there was one frontier here that could not be overcome at this congress. It is the barrier erected by a small enclave of Portuguese archaeologists to protect their little patch of vested interests. The members of this xenophobic little technocracy were not only conspicuous by their absence at the event, their leader and spokesman, when asked by journalists about this, chose to denigrate the event and its participants on national television, first deliberately offending every single conference delegate on air, and later calling IFRAO an organisation of 'loonies', in an enraged letter to Professor Jack Steinbring, the chairman of the IRAC 1999.

Throughout Europe, the national borders are undeniably coming down, and the enlightened leaders of Portuguese archaeology are busily engaged in tearing down the barriers that have in the past prevented the local discipline from unfettered international collaboration. One of the most auspicious special events of this Congress was the launching of a remarkable new academic journal, the *Journal of Iberian Archaeology*, edited by the statesman scholar of Portuguese archaeology, Professor Vítor Oliveira Jorge. This journal is to appear in English, a deliberate step to open up Iberian archaeology to the world community. It may well turn out to be of great importance to the peninsula's archaeology, even the name of the underwriting organisation speaks for itself: the Association for the Improvement of Cooperation in Iberian Archaeology. After all, the name implies in no uncertain terms that such improvement is possible and desirable. The journal is of very high academic quality, and readers are strongly encouraged to subscribe to it, or have their institutes place orders (ADECAP, R, Aníbal Cunha, 39 - 3° - s. 7, 4050 Porto, Portugal).

But the Vila Real Congress had many other highlights. For the first time in the history of IFRAO, the proceedings of one of its conferences were broadcast live on the Internet. The host institution, UTAD, had met the very considerable cost, not only of setting up a computer room with a battery of PCs, but also of installing state-of-the-art equipment for direct-to-air filming and sound production. This was made possible by the technical support of a special unit within UTAD, called GeIRA. One of the four academic sessions was thus transmitted continuously to the World Wide Web.

The field trips were further highlights. The Trás-os-Montes region is one of the most famous wine-growing areas of the world, whose potential was recognised already by the Romans. It is also an ancient border zone, so there are numerous old castles and hill-top villages, some dating back as far as the Chalcolithic period. Many of the surviving stone bridges built by the Romans are still used for vehicular traffic. The region abounds with extensive vineyards, often covering every hillside in sight, and the ubiquitous almond, olive and cork tree groves form a uniquely spectacular landscape. And then there was the rock art, ranging from the deeply hammered petroglyphs at some Côa sites to the faint and delicate incisions at such sites as Vermelhosa, or the occasional painting site, all in their beautiful valley settings. There was enough to see for all rock art enthusiasts, and all seemed amply satisfied — except Stuart

Reevell, who threatened his tour guide, Pedro Couteiro, to break his legs. Unfortunately I missed Stuart's paper (about virgin-whores, Marx in caves, the 'phallacy'-of-violence of fencing posts), I would have been interested in his psychoanalysis of the 'archaeo-cartographic project', which itself cries out for analysis.

The Vila Real congress marked the tenth birthday of IFRAO, and the end of the formative period of the Federation. With the presidency now held by Portugal, IFRAO begins its phase of consolidation and of providing the discipline with the sense of direction it needs for the transition into an new millennium. It was at Vila Real that the members of the large Brazilian delegation, buoyed by the excitement generated by the Congress, decided to form a Brazilian rock art organisation. This is particularly significant as the rock art specialists of Brazil had traditionally been divided by ideological and personal differences. There is also talk now of forming new rock art organisations in Scandinavia, Germany, central Asia and northern Africa, all of which intend to seek affiliation with IFRAO.

On behalf of IFRAO I thank UTAD and its Rector, Prof. Dr Torres Pereira, for hosting this most genial event so masterfully. I thank the GeIRA Team and the CIUTAD Team for their technical support, and the Secretariat for its magnificent work. But most of all, I thank you, Mila, for giving us this memorable and most enjoyable Congress.

Robert G. Bednarik
RAR 15-471

SYMPOSIUM RATIONALES, IRAC 1999
Calls for papers

Semiotics, signs, symbols and mysticism in rock art

Co-ordinator: Majeed Khan

The semiotic and cognitive role of rock art has replaced the earlier aesthetic approaches. The imagery could represent the visual record of events or could be symbolic in the sense that human and animal figures and other geometric and abstract motifs stand for concepts. The combination of various motifs creates a coded and symbolic pictographic writing system which later led the users of these images towards the origin of proper writing. The semantic and epistemological phenomenon of rock art will be discussed in the light of current research and hypothetical assumptions suggested for the interpretation of pre-Historic art

Sexual, mystical and mythical illustrations are found in the rock art of various cultural periods almost all over the world. Sexual symbolism in Palaeolithic rock art has long been pleaded. The conception of socio-cultural phenomena makes it a useful illustration and if such a mode of analysis can be shown to throw new light on the subject, the value of such analysis will be demonstrated. Comparative socio-cultural analysis of sexual illustrations, mythical and mystical symbolism in rock art is required.

Papers are invited from cultural anthropologists, epistemologists, semioticians, epigraphers and scholars of related disciplines. Please send abstracts of your papers to the symposium chairperson:

Dr Majeed Khan
Deputy Ministry of Antiquities and Museums
P.O. Box 3734
Riyadh 11481
Saudi Arabia Fax : (009661) 4041 391

Computer technology as an aid to rock art research, site management and education

Co-ordinators: Robert Mark and Evelyn Billo

Suggested topics include, but need not be limited to:
Computer aided photography: image enhancement, colour issues, panoramas and stitching/rectifying photos, scanners vs. digital cameras, 3-D techniques, remote sensing, comparison of historic to recent photos.
Multimedia projects: QuickTime Virtual Reality, Digital Video, Compact Disk or visitor kiosk projects.
World Wide Web: design, information exchange, list servers, concerns.
Database studies: image archive considerations, GIS, GPS, sharing data, statistical approaches, actual case studies and experiences.
Potential for the future: artificial intelligence, image matching.

The presentations will be 20 minutes. Abstracts (350 words maximum) should be sent by e-mail to *rockart@infomagic.com*. Please list any special equipment you would require. You may also respond by regular mail to:

Evelyn Billo
Rupestrian CyberServices
3644 N. Stone Crest Street
Flagstaff, AZ 86004-6811
U.S.A.

*

Landscape, place and rock art

Co-ordinators: Paul Faulstich and Jane Kolber

In the company of indigenous people, one cannot escape their consuming place-orientedness. For millennia, these peoples have utilised graphic and cognitive systems to symbolically represent their connections to the landscape. A ubiquitous expression of human cultural geography is rock art, which often displays graphically elements of the physical and symbolic connections between peoples and the land. This symposium will explore a range of these expressions, using case studies from throughout the world.

Rock art has been one of the most powerful mechanisms through which native peoples have organised, understood and expressed the significance of places. Another look at it from an ecological/geographical perspective will help illuminate ways in which diverse cultures are situated in the landscape in which they dwell. At the heart of this symposium lies a fundamental question concerning the nature of these cultural ties: How and what does the rock art express about human ecology and the 'sense of place'?

The sense of place has been on the periphery of anthropological interest, but it has not occupied a central theoretical position; anthropological appraisals of emotional and perceptual responses to environmental stimuli have been minimal. Generally, social scientists have viewed the natural environment in terms of its biological effects on adaptation, or its corresponding socio-political constructs. This symposium situates considerations of human actions within a different view of environment; one which emphasises symbolic constructs of it. It is concerned with how rock art and cultural meaning are constructed out of the phenomenal elements of the land.

Proposals for papers exploring the varied relationships between landscape, place and rock art are invited and should be sent to:

Dr Paul Faulstich
Pitzer College
1050 N. Mills Avenue
Claremont, CA 91711
U.S.A.
Tel.: 909/621-8818
E-mail: *paul_faulstich@pitzer.edu*

or Jane Kolber (see below)

The human figure in rock art

Co-ordinator: Jane Kolber

Humankind has always recreated humankind. We are fascinated with our own image and so were our ancestors. Take the portrayal of the human figure off the stone wall and examine it. How do these figures vary throughout the world? Have some cultures stressed certain aspects? How do proportions vary? How do they relate to their environment and to the other figures they are associated with. How is the human figure adorned? What activities and positions are displayed? What percentage do they have in the whole body of rock art? At a site, in a region, in the world? Where are they missing? Why do people portray people? Are any of the rock images portraits? What methods and techniques have been used? Have these carvings and paintings been used for further purposes? What do you know about the human figure as it occurs in rock art? What will we find out if we put all our information together?

Please send a less than 300 word abstract to:

Jane Kolber
P.O. Box 1844
Bisbee, AZ 85603
U.S.A.
Tel. and Fax (520) 432-3402
E-mail: *jkolber@theriver.com*

Arte rupestre de Sudamerica: Estudo actual

Coordinadores: Mario Consens y Ana Maria Rochietti

El conocimiento del arte rupestre de Sudamérica prácticamente explotó en los últimos diez años. Producto de un mayor interés académico, de la toma de conciencia de su particular y único valor como patrimonio, y de la expansión y surgimiento de las actividades llevadas a cabo por ONG especializadas, en varios países. Este Simposio procura brindar el contexto para que los investigadores brinden los resultados de sus trabajos tanto en las investigaciones de campo, los aspectos teóricos y metodológicos que desarrollaron, las acciones de preservación y prevención, técnicas de relevo y documentación y el análisis de las políticas sostenidas por las instituciones oficiales de Patrimonio en nuestros países. Apuntamos que en el final del Simposio, podamos realizar una síntesis del estado actual de la investigación del arte rupestre en Sudamérica. Y proponer resoluciones académicas que apoyen la labor de las instituciones reconocidas internacionalmente en las áreas legales, administrativas y las políticas de planificación en sus respectivos países.

South American rock art: current state

Knowledge of South American rock art increased exponentially during the past ten years. The reasons for this development can be seen in the convergence of higher academic interest in this topic, the recognition of its unique value as cultural heritage and the onset and expansion of related activities by specialised NGOs in various countries. This Symposium intends to offer a context in which researchers can present their field work, theoretical and methodological ideas, actions for protection and preservation, techniques of documentation

and registration as well as an analysis of the policies instituted by those authorities concerned with the cultural heritage in our countries. At the end of this Symposium we will attempt to summarise the current state of rock art research in South America and table academic resolutions to support the effort and objectives of all recognised institutions concerned with the legal, administrative and political planning of research in our respective countries.

Arte rupestre de América do Sul: Seu estado atualo

Conhecimento sobre o arte rupestre da América do Sul praticamente explodiu nos últimos dez anos. Isso foi o produto de um maior interesse acadêmico, da tomada de consciência do seu particular e único valor como patrimônio, e da expansão e surgimento das atividades organizadas pelas Universidades e pelas ONG especializadas, em vários países. Este Simpósio procura brindar o contexto para que os pesquisadores brindem os resultados dos sus trabalhos tanto nas pesquisas de campo, os aspectos teóricos e metodológicos que desenrolaram, as ações de preservação y prevenção, técnicas de relevamento e documentação e o análises das políticas suportadas pelas institutos oficiais de Patrimônio em nossos países. Procuramos que no final do Simpósio, possamos realizar uma síntese do estado atual da investigação da arte rupestre em América do Sul. E propor resoluções acadêmicas que apoiem o trabalho das institutos reconhecidas internacionalmente nas áreas legal, administrativas e nas políticas de planificação nos seus respetivos países.

Fecha limite para enviar resumenes de hasta 150 palabras en formulario: Data limite para enviar resumos de ate 150 palavras em formulário: 15 de noviembre de 1998.

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En caso de tener alguna duda, favor comunicarse con nosotros
Mario Consens: *consens@adinet.com.uy*
Ana Maria Rochietti: *anaau@cvtci.com.ar*

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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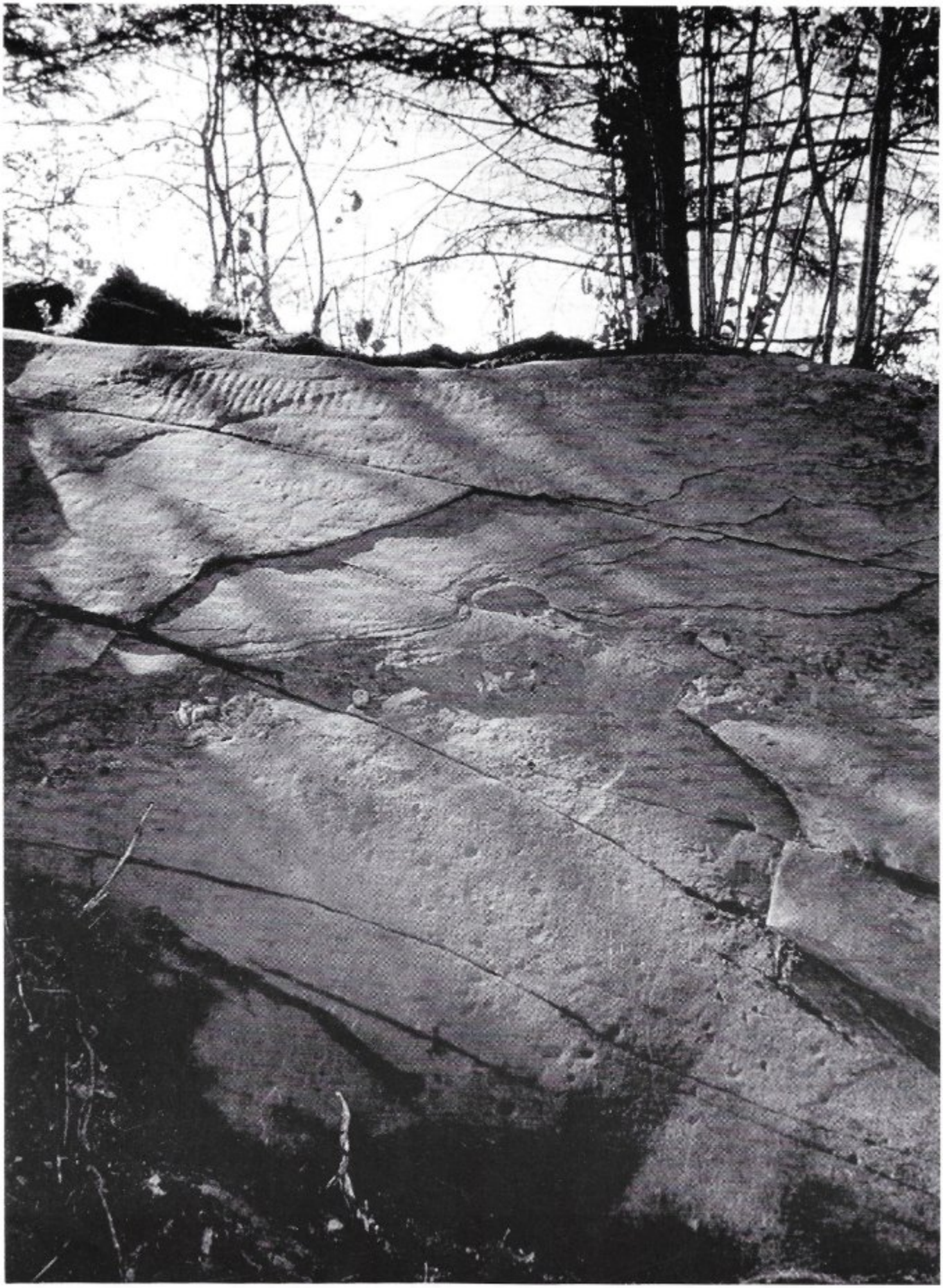

The Re II panel, illuminated by the morning sun. Stjørdal, central Norway. (Figure 7 of article by K. Sognnes and A. Haug, see page 104. Photograph by A. Haug).