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## DATING AND TAPHONOMY OF PLEISTOCENE PALAEOART

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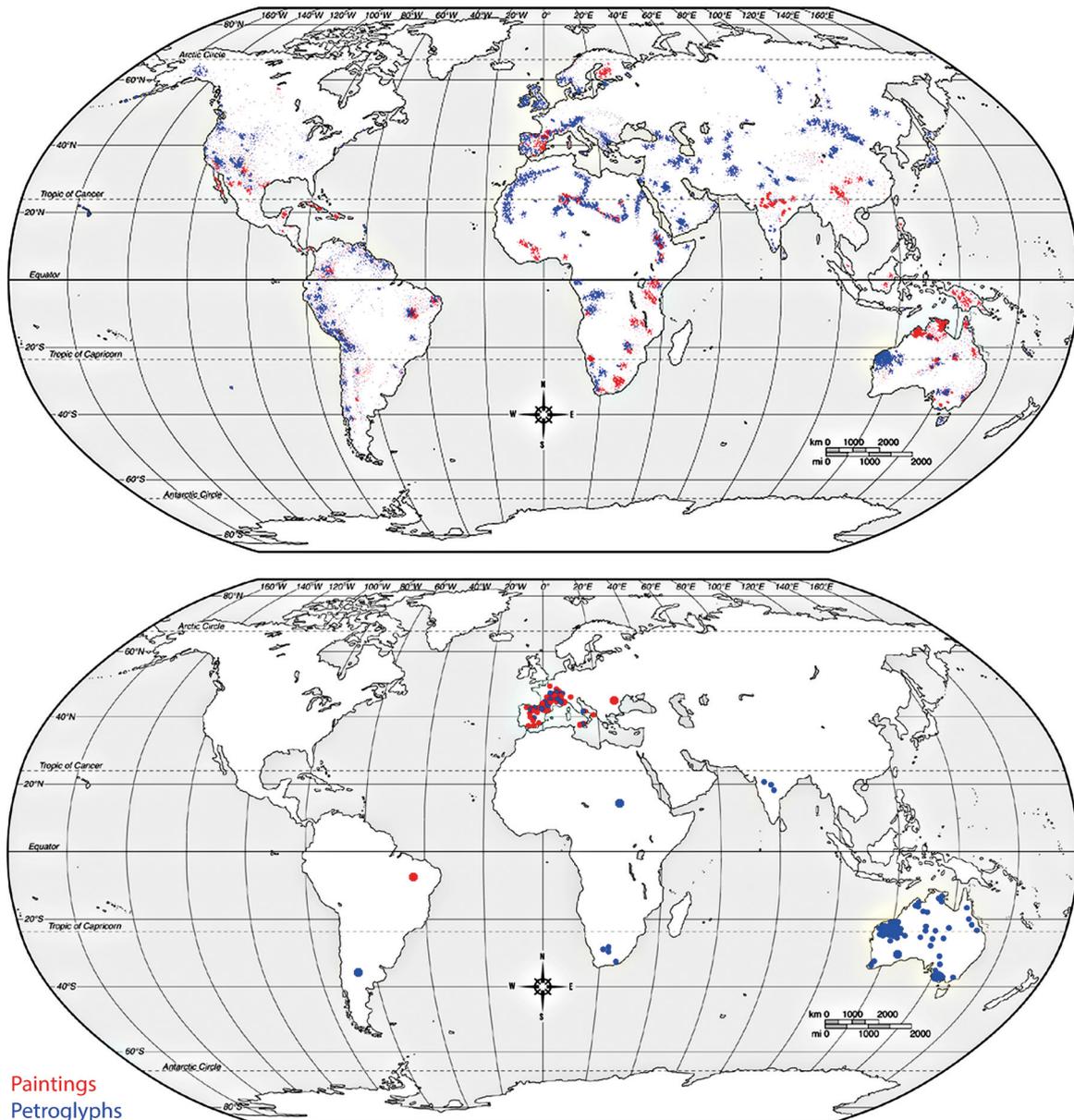
## DATING AND TAPHONOMY OF PLEISTOCENE ROCK ART

Robert G. BEDNARIK

It has been estimated that the world's surviving rock art can safely be postulated to be in excess of 50 million motifs, and quite possibly even more than 100 million. These are, however, unevenly distributed around the globe. Most of the world's major corpora occur in arid or semi-arid regions that are not assumed to have supported high population densities. Preferential survival of rock art in deserts is attributable not only to their low rainfall and high ambient pH regimes, but also to the lower exposure to anthropic deterioration. The taphonomy of rock art determines the composition of the surviving corpus of world rock art. Present distribution or apparent changes in rock art "styles" over time are not necessarily functions of economic, environmental, cultural, social or even religious factors. Thus direct correlation between "quantifiable" archaeological "data" and rock art poses problems, and the lack of reliable dating for nearly all rock art in the world only aggravates these.

Taphonomy, a major encumbrance in statistics of rock art, deals with the logical underpinning of the idea that the quantified characteristics of a record of past events or systems are not an accurate reflection of what would have been a record of the live system or observed event. Without the use of taphonomic logic and concepts such as taphonomic lag-time or taphonomic threshold, very limited scientific understanding of rock art is attainable. Most rock art can be assumed to have been lost over time, with the proportional loss index increasing linearly with time. Thus the cultural significance of extant statistics is subordinate to their taphonomic significance. Perceived trends in the ways rock art presents itself to our subjective perception and cognition are often presented as evolutionary, chronological (by circular argument) or empiricist evidence. In addition to geomorphological biases, many other factors can also greatly distort the statistical characteristics of rock art. Among them are location, recorder's bias, historical responses to alien iconographies, or indeed any process that contributes to the degradation of the art. Lithology, site morphology, micro- and macro-climate, site biology and a host of other taphonomic factors have all contributed to selective survival and to alterations of both the appearance and statistical characteristics of the surviving corpora. Any interpretation using variables such as distribution, location, style or technique is doomed to failure unless informed by taphonomic logic.

The most debilitating aspect of rock art taphonomy, whatever the physical, biological or chemical processes responsible for it may be, is that it distorts evidence systematically rather than randomly. It selects the most deterioration-resistant forms for survival so that its truncation of the record is highly discriminate. The forms of rock art that can survive longest are paintings and engravings in deep limestone caves with their stable speleoclimate; and at open sites deeply executed petroglyphs on the most weathering-resistant rock types, preferably occurring in favourable climatic settings. It is at once obvious that all rock art credibly attributed to the Pleistocene falls into these two categories.



Known rock art occurrences (top) compared with tentative distribution of Pleistocene rock art (bottom).

The issue of Pleistocene rock art is rendered even more complex by our continuing inability of securing reliable dating of most rock art. With few exceptions, rock art age estimations so far presented are generally experimental, ranging from the credible to the fictitious. In particular, the attribution of rock art to the Pleistocene, on whatever basis, remains in many cases most tenuous. Therefore the present perception of what is or is not Pleistocene rock art, globally, is also greatly distorted by false datings, often based on stylistic perceptions and similar subjective variables. Finally, there is the issue of relative regional research efforts, which has also contributed significantly to distortions concerning this topic. Nearly all publications on Pleistocene rock art deal exclusively with western Europe's Upper Palaeolithic traditions, yet most of this phenomenon is located outside of Europe. In Australia alone there is far more rock art of such antiquity, and all of it is Mode 3 ("Middle Palaeolithic") rather than Mode 4 production.

Thus the Pleistocene rock art of the world has remained largely ignored so far. It offers Lower Palaeolithic examples from India and possibly Africa, and a massive corpus of Mode 3 petroglyphs from Australia and elsewhere. By comparison, the Mode 4 traditions of south-western Europe are not of great importance because they are only a small piece in the overall puzzle. Most parts of this great puzzle have not yet been found or properly considered. The global distribution of Pleistocene rock art remains therefore unknown. However, we are not entirely without relevant information, and if we tried to depict the known or reasonably assumed world distribution of Pleistocene rock art we could create such a map (figure). This is empirically based, but we need to remember that there are severe limitations involved. It does, however, help to gain a more balanced view of the subject, and it certainly helps in re-focusing our endeavours in this field. Most certainly, a map of the global Pleistocene rock art will look very different in a hundred years from now, but this is a first step to securing it.



## FROM FROZEN-MEAT CARVING TO IVORY SCULPTING

Ahmed ACHRATI

Taphonomic studies of skeletal remains focus on the analysis of bones and their articulation, cooking, secondary usages and disposal. Lithic tools are also studied from the point of view of their typology, quantity, wear, source, and settlement patterns. What is totally absent from the literature is the processing of frozen carcasses. Yet, frozen carcasses must have been a common occurrence in the cold zones, at least seasonally. Upper Palaeolithic people may even have integrated frozen meat into their food processes in an unexpected way.

It is possible to cut fresh meat with a wide range of sharp tools. When meat is frozen, however, the most efficient cutting method is to use a lithic blade to slice / shave off pieces of flesh. A lithic blade provides an efficient combination of friction and fracture energies. Blunted on one edge, blades transmit the energy of the fingers efficiently and minimize injury.

Once acquired, the proficiency of cutting frozen meat with blades can be employed to manipulate the fracture properties of hard materials such as wood, bone or ivory for utilitarian and aesthetic purposes. If such is the case, then frozen carcasses likely played an important role not only in the systematic spread of blades, but also in the development of carving and the production of portable art in Europe, where freezing conditions are more salient. It is likely that frozen carcasses played a considerable role in the emergence of the Upper Palaeolithic technological and artistic traditions in Europe, the making of ivory figurines in particular.

### Ivory sculpting

Recovered artefacts often reveal a lot about how they were made thanks to the marks they bear which allow us to identify the tool used to make the artefact, its shape, type and constitution. For example, blades used for whittling usually show two types of wear: polishing along the edge of the tool, which gradually fades the farther from the edge; and striations appearing as microscopic lines perpendicular to the edge or slightly inclined from it, indicating the direction of the hand movement. Those that wear characteristics of whittling tools appear on the ventral side and are less distinctive on the other side.

Most of the early Upper Palaeolithic figurines and personal ornaments in Europe were made of ivory, although bone, antler, talc and clay were also used. The repertoire of preserved ivory artefacts includes fine human and animal figurines, batonnets, beads, knives, points, and unfinished items. They come from western and central European Aurignacian sites, including Spy, Geissenklösterle, Vogelherd, Kostenki and Avdevo.

As Semenov has indicated, most of the ivory objects, particularly figurines, could not have been made without whittling blades, which explains the widespread presence of prismatic tools in the Upper Palaeolithic.

Indeed, prismatic blade technology is predominant in the most significant Aurignacian sites. At its lowest level, for example, Kostenki 14 contains various blades, end-scrapers, burins, pièces esquillées, and small bifaces. These tools were recovered with bone points, antler mattocks, worked ivory, perforated shell ornaments and an unfinished ivory carving of a human figurine. At Geissenklösterle cave, refitted nodules excavated from Aurignacian layers show that they were all used for blade production.

Reliance on blades is also indicated in the increase of split-base points, dating to the early Upper Paleolithic in western and central Europe. Burins and chisels, also present, were used for making notches and hollows on figures, removing excess material, and smoothing the contours and giving definition to the details.

The ivory supply for these artefacts came mainly from mammoth tusk, either fresh or fossil. Reconstruction of climate, based on the evidence of sedimentology and environment, suggests that ivory-working took place here during a period of extreme cold.

Carving ivory is limited by the internal structure of the tusk and the growth patterns of its enamel and dentine (Schreger lines). Often, to make a figurine, the tusk's natural shape is utilized and corrected rather than totally transformed. First, a piece of ivory is cut to the desired proportion using transverse incisions consisting of shallow notches around the circumference of the tusk and penetrating one or two layers of ivory. The ivory is then broken by applying pressure. For a longitudinal splitting of ivory, grooves are applied.

Although some flaking is possible by exploiting cracks in the surface of the cortex, the reduction process consists mostly of whittling, shaving and smoothing. Figurines were carved with unretouched and retouched tools, with final polishing eliminating most traces of the carving. The tools used, particularly blades, produce thin parings that curl up into circles and hardly cause friction on the upper side. Unfinished ivory objects, lithic tools and small curved shavings have been found in caves such as Vogelherd and Geissenklösterle. Traces of whittling on ivory and bone objects from Kostenki I are numerous.

These reduction steps are all present in a figurine from Avdeevo, which shows traces on its surface of whittling with a knife, and clear furrows cut with the angle of a burin that show best on the body and legs.

The reductive processes involved in tool making and frozen meat carving were applied to ivory, bone and soft stone, and sculpture emerged as an artistic phenomenon with social underpinnings and implications.



## TAPHONOMIC APPROACH TO THE WALLS OF DECORATED CAVES

Catherine FERRIER, Évelyne DEBARD, Bertrand KERVAZO, Norbert AUJOLAT†, Dominique BAFFIER, Alain DENIS, Valérie FERUGLIO, Carole FRITZ, Bernard GÉLY, Jean-Michel GENESTE, Stéphane KONIK, Delphine LACANETTE, Roland LASTENNET, Frédéric MAKSUD, Philippe MALAURENT, Frédéric PLASSARD, Gilles TOSELLO

### Objectives

In decorated caves, the aim of taphonomic studies is to understand the evolution of the wall surfaces. It is thus possible to reconstruct the initial state of a wall before the realization of art works and understanding the processes that occurred after the presence of humans:

- what processes modified the drawings after their realization? Can we identify the parts of the cave where artistic representations have disappeared? What is the difference between the initial corpus and that which is preserved today?
- what were the reasons for choosing certain panels and techniques?
- can we predict the phenomena that will degrade the representations and identify the sectors that will be affected?

### Procedure

The states of the wall result from physical, chemical and biological processes that act at the interface between the stone and the atmosphere of karstic conduits. To understand their genesis, our procedure consists of constructing a database of the facies and studying a non-decorated cave that we use as a cave-laboratory, permitting the use of instruments and experiments.

### Results

The following are four examples of facies drawn from our study of the cave of Chauvet.

#### *Facies anterior to the human presence*

Microformes inherited from the speleogenesis

On the panel of the Segmented Rhinoceros, the states of the wall correspond to three staged facies inherited from the early history of the cave. The smoother median facies was chosen for the realization of the figure. In the adjacent Cactus Gallery, two bears were drawn on an analogous facies. This morphology thus appears to have been favored for use as a support.

#### Phosphate coating due to bat guano

The walls of the Hillaire chamber are affected by sub-vertical, gray trails of hydroxyapatite, interpreted as a neogenesis due to leaching by bat guano. On the Megaceros Panel, this facies, which is anterior to the drawings, appears to have limited their extension.

#### ***Facies contemporary with the human presence***

##### Rubefaction and flaking: thermal facies

With an anthropogenic origin characterized by red and gray shades and by flaking of the stone. This is the result of a thermal impact caused by fires probably dating to the end of the Aurignacian human presence. Chauvet Cave is the first example showing that fires could have a significant effect on the walls. The impact on the artistic representations is nonetheless limited.

#### ***Facies posterior to the human presence***

##### Run-off: erosion and concretions

Run-off more or less intensively eroded or masked the artistic representations. On the Panel of Horses, concentrated run-off led to the erosion of pigment and micro-incisions, due to the softness of the stone, while on the Panel of the Red Bear, they only eroded the drawing. The formation of concretions produced seven colored calcite trails in the Alcove of Lions. The trails did not destroy the lines of the figures as they did on the nearby Panel of Horses.

#### ***Distribution of the facies in time and space***

The changes in the state of the wall could have occurred between two stages in the realization of the art works: on the Megaceros Panel, the first drawings were done with charcoal on hard stone. A fan-shaped sign was made by scraping on a wall surface that had become plastic.



Chauvet Cave, Horse Sector (length: 9.50 m). Several wall facies are present on these panels: phosphate formation, run-off with erosion and concretion formation (photo: C. Fritz, G. Tosello).

The facies vary spatially as well, and at different scales. If we consider Chauvet Cave as a whole, the microforms inherited from its speleogenesis affect two large sectors. The first one, near the entrance, has mostly irregular surfaces on which isolated animal representations are the most numerous. The second has walls with regular surfaces on which the large panels were realized.

In the same sector, some states of the wall are intermittent and of variable dimensions, while others occur in stages parallel to the ground. This is true on the Megaceros Panel where the lower part of the wall, marked with depressions made by corrosion, was not used as a support, in contrast to the smoother facies higher up.

At the scale of a panel, run-off can result in variable facies produced by multiple factors (type of fissures, hardness of the stone, ...).

## **Conclusion**

The study of the facies of the walls raises numerous questions that can be addressed through collaborations involving new research fields. To understand the karstic ecosystem, an interdisciplinary research approach is necessary, bringing together parietal art specialists, geoarchaeologists and archeometric specialists. Other disciplines currently being developed for the study of decorated caves could be more systematically integrated (e.g. modeling and microbiology).



## DATING ROCK ART:

### Two New Methods for Pictographs and Petroglyphs

**Bryan GORDON**

Two new methods for dating rock art with underlying soil have been tested under ten pictographs and five petroglyphs in seven regions of Canada, Mexico and the United States. Both assume pigment particles or paint droplets or hammerstone chips and the dust they created fell to the feet of the artist. This is like chalk dust at a blackboard, droplets while painting, or marble chips and dust in sculpting. Both require finding the soil level with this material and AMS dating its organic matter. Dating precision varies with the thickness of each level analyzed, especially for palimpsests with art of different periods in several levels. We have scraped and collected levels varying from 5-12 mm.

Pictograph pigment seen in photographic or microscopic enlargements is verified with scattered electron microscopy. A coating of water-soluble glue on common copy paper applied to each level removes its surface sediment. The rest is sifted and photographed in stages over a wide cardboard.



Scraping and sieving levels for hammerstone chips and their pulverized rock flour, plus AMS samples, at the Thunderbird petroglyph (Brickyard site, Gabriola Island, Canada).

It becomes backfill, as its pigment is invisible until enlarged, but adds to glue sheet counts. Pigment taken from a glue sheet with a damp cotton tip under a microscope or hand lens is dropped in a gelatine capsule for shipping and SEM analysis.

Hammerstone chips and pulverized rock flour occur in petroglyphs with underlying soil (figure). Big chips and pebbles remain in a 4 mm mesh deep fry basket; small ones and fine gravel pass to a nested 1 mm mesh kitchen sieve. Hammerstone chips differ from stone flakes and other contents in being chunky, sharp and of different material. Chips are bagged separately from datable shell, wood, charcoal, plant or bone fragments, which are removed with tweezers. Pebbles, rootlets and unwanted debris are discarded. If clay clogs the sieve, water immersion lets it, silt, sand and flour pass. Suspended clay and silt are decanted and the sand-flour mix separated by fine wet sieving.

I assume soil pigments or sharp chips linked to rock flour denote either pictographs or petroglyphs. Pigment may be residue from a burial or other ritual, but we have never found human bone or painted artifacts. Both dating methods assume soil strata are parallel to the ground surface, an assumption minimized by scraping thin layers within a footprint-sized test made possible by refining our initial larger tests. I assume soil under a motif made in a single application has most pigment and hammerstone fragments in one level, minimizing SEM analysis and AMS dating. I assume several applications to one motif or a series of palimpsests result in several levels with pigment or chips. Their dating may show sequential visits, some spanning centuries. Separate motifs are best tested individually. I assume a pigment particle or some rock flour in one level, especially at the rock/soil interface, were rain-washed down the rock face, perhaps long after the art was made. We avoid soil altered by wind or water, as in desert “washes” and shorelines.

Both methods are artistically non-destructive, quantifiable, repeatable, falsifiable and applicable to cave, boulder and cliff walls and ceilings, and possibly open-air flat bedrock with nearby soil-filled cavities. They do not touch the art and are quantifiable, as fallen hammerstone chips, pigment and rock flour are distinct and datable based on proximity to organic material, as in traditional archaeological dating. Both methods are repeatable if new tests are placed alongside. Both are falsifiable if pigment or sharp-edged flakes without rock flour are absent. Dating will change our interpretation of rock art by providing a time-line. This is especially true if a corpus of similarly dated art in one region forms a pattern. Petroglyphs are 90% of all rock art, yet dated ones are based mainly on style. Each test needs a few hours and works in damp soil with petroglyphs. Pigment and some rock flour washed down the rock face by rain may appear above the artist’s floor in a line at the rock/soil interface.



## DATING THE ARCHAEOLOGICAL CONTEXT AND ESTABLISHING PLEISTOCENE FREQUENTATION IN CUEVA DE NERJA (MÁLAGA, SPAIN)

**Antonio ROMERO, Araceli CRISTO, Maria Ángeles MEDINA  
José Luis SANCHIDRIÁN**

In this paper we present a collection of prehistoric material associated with the rock art found in the Lower Galleries of Cueva de Nerja. Forty-two assemblages were documented in the Lower Galleries and parts of the Upper Galleries. The majority of these were carbonaceous remains, but skeletal remains, shells, and artefacts were also found.

A series of radiometric datings have been made for some of this material and the results merit further reflection. We have provided a brief summary of these results and outlined several different stages in the frequentation of the inner chambers of Cueva de Nerja during the Upper Palaeolithic.

The most recent phase dates to  $14320 \pm 90$  BP and corresponds to the height of the Magdalenian technocomplex in the Iberian Mediterranean. No evidence has so far been found in the settlement area of Cueva de Nerja that is directly associated with this chronology. One of the conclusions in this regard lies in the determination of the frequentation of the cave at that time and hence of the southern peninsular region. At the same time, the location of the sample in question (assemblage no. 40) is striking, as it is in a location that is difficult to reach, half-way between the chambers of the Lower Galleries and the Upper Galleries, and it is only accessible via these galleries. Furthermore, an equid protome was also found in the vicinity of motif Ne.230, in a position vertical to the floor. This indicates that there was some frequentation of this part of the cave at the time and possible frequentation of the Upper Galleries during the Late Glacial Maximum. This would tie in with the production of rock art at Cueva de Nerja, specifically the pinnipeds (Ne.254-256) in the Salón de los Delfines in the Upper Galleries, which up until now have been placed in the Magdalenian.

The second phase appears to correspond to the Solutrean and in turn can be subdivided into two stages. Assemblage no. 41 had already been dated to  $19900 \pm 210$  BP and from a global perspective can be placed in the middle Solutrean. The figure of the quadruped with which it has been associated (Ne.241) also has characteristics that correspond to the proposed date and horizon. In turn, assemblage no. 37, which has been associated with a painting of a red goat (panel Ne.220), and which had been mixed with moonmilk on the floor of the cave, has been dated to  $20980 \pm 100$  BP, corresponding to the middle Solutrean or, if we take standard deviation into account, the lower Solutrean, which is a phase that was also recently detected in the Sala del Vestíbulo at Cueva de Nerja.

The third phase begins with assemblages nos. 30 and 35 and dates to the Gravettian. Assemblage no. 35, which was found in the northern part of the Sala del Cataclismo, was located in a natural concavity formed with moonmilk agglomerate and has been dated to  $23800 \pm 140$  BP.



Assemblage no. 3 (*Pecten concretizado*) in the Galería del Fémur.

In contrast, assemblage no. 30, which has been dated to  $24\,130 \pm 140$  BP, was dispersed, and was found on the floor of Los Órganos in the Lower Galleries. These dates correspond clearly with the development of the Gravettian in the whole of the Mediterranean Iberian Peninsula.

In the Sala del Vestíbulo of Cueva de Nerja, there is evidence of occupation during this time of a Gravettian techno-typology. Given the results for the material that has now been dated however, an earlier dating of some of the rock art in Los Órganos could be considered. Motif Ne.133/III, which involves the outline of a cervid in a vertical position, was made in a “trilinear convention” and was initially dated to the early stages of the Solutrean but could have an earlier chronology that would perhaps be more consistent with the latest radiometric datings. In any case, there was clearly frequentation of the deepest sections of Cueva de Nerja during the Gravettian period.

Finally, the earliest phase that  $^{14}\text{C}$  AMS results can be dated back to is an Aurignacian stage, and assemblage no. 39 in the Fondo de Cataclismo has produced the staggering date of  $35\,320 \pm 360$  BP. Due to its location in the recesses of the Lower Galleries, we would have liked to attribute it to the premature presence of anatomically modern humans in the cave, however the dating also coincides with the end of the Middle Palaeolithic in the southern peninsula, and in this case Neanderthals may have frequented the cave as far as these chambers. At present, this dating is one of the earliest known, as Aurignacian level 11 at the site of Bajondillo near Bahía de Málaga has been dated to 32-33 ka BP, and level 13, which is more problematic, has been dated to around 37 ka BP.

We must emphasize that we are aware that these dates are new and problematic, and we intend to continue dating all of the material found. We are also carrying out a review of all the pictorial groups in view of these new findings, which merit further reflection.



## THE CHRONOLOGICAL CONTEXT OF PLEISTOCENE ART IN SIBERIA

Lyudmila LBOVA

Some basic features characterize modern human sign behaviour in early Upper Palaeolithic archaeological assemblages. The main group in Siberian Pleistocene art includes personal ornamentation, part of a symbolic system (perforated animal teeth, shells, stone and bone pendants), and musical instruments (for example, whistles or flutes made out of bird bones).

The region under investigation is located in a contact zone of different landscape areas in northern and central Asia. While Siberian Upper Palaeolithic sites are rather numerous, it is so far difficult to estimate beginnings due to a lack of reliable dates and to the absence of a detailed technical or typological analysis of industries. Studies of key geoarchaeological sections in Siberia have made it possible to reconstruct the environmental conditions of Palaeolithic human occupations, and to build a general chronological scheme for the main stages of human cultures.

Middle and Upper Palaeolithic sites may have co-existed in Siberia for a long time, from about 50 000 to 27 000 BP. Obviously, more work needs to be done in order to better understand the chronological and archaeological patterns of this process, as recently shown in discussions about the Eurasian record of the Middle to Upper Palaeolithic transition and the origin of Upper Paleolithic cultural phenomena. More than 500 absolute dates are available for the Siberian Upper Palaeolithic complexes, based on traditional as well as new dating techniques (e.g.  $^{14}\text{C}$ , RTL, thermo-gravimetry).

Recent discoveries of Early Upper Palaeolithic series of artefacts indicate the existence of symbolic traditions, with more than 100 items from bone, stone, shell and sea shells. Artefacts were unearthed from stratified sites such as Tolbor (Mongolia, excavation of S.A. Gladishev); Kamenka, Varvarina Gora, Khotykh (Transbaikalia, excavation of L.V. Lbova); Podzvonkaya (Transbaikalia, excavation of V.I. Tashak); Voennyi Gospital, Pereselencheskiy punkt-1 (sub-Baikal region, excavations of D. Chersky [1871], G.I. Medvedev and E.A. Lipnina); Kara-Bom, Denisova Cave, Strashnaya Cave (Altai-region, excavation of A.P. Okladnikov, A.P. Derevianko, V.T. Petrin, M.V. Shun'kov, A.N. Zenin), Malaya Syia (Sayan-region, excavation of V.E. Larichev, Y.P. Kholushkin). These complexes are dated in the range of 30-43 ka, and related technologically to the initial stage of the Upper Palaeolithic. Particularly interesting are the archaeological and chronological contexts of artefacts (living horizons, structure of sequence, placing features...), and the items themselves, their morphological, technological and semantic characteristics. Research of early symbolic human activity, cultural archetypes origin and forming in Early Upper Palaeolithic in Siberia are based on technological and morphological analysis of items showing symbolic behaviour, as a basis for study and interpretation of these materials.

Functional research of artefact production technology is based on the wear-analysis method. We also used the synthesized tracing technique developed by P. V. Volkov and adapted for work with Palaeolithic and Neolithic archaeological assemblages in northern Asia. Production and wear evidence of artefacts along with experimental technological research allow us to reconstruct the technological process of manufacturing lithics.

Several unique artefacts of the EUP (35-40 ka) with a different geometrical form and morphological features form a special group. These are: bead from talc, agalmotolit (steatite) of lenticular shape, a unique elongated pendant with central by-conical hole, a sub-square bone bead (Strashnaya Cave, Tolbor, Denisova Cave), and items of ostrich eggshell with drilling (Podzvonkaya). Ornamented stone pendants in archaeological collections are dated to 25-30 ka (Khotyk 2, Pereselencheskyi punkt-1). However, ornamentation of decorations did not occur in early assemblages, dated to 35-40 ka.

A separate mention should be made of the findings of musical instruments in the early Upper Palaeolithic layers in the Baikal-zone: a fragment of a flute (Khotyk) and a whistle (Kamenka-A), similar to some from German excavations.

Geoarchaeological methods, meant to elaborate detailed local chrono-stratigraphic and cultural-historical schemes, have led to identifying chronologically divergent sites in southern Siberia. The Early Upper Palaeolithic is represented by two technological trends, the predominant one based on blade production (two versions of the industrial complex – the tradition of Kara-Bom and the tradition of Kara-Kol), and the secondary one on other reduction techniques (e.g. orthogonal cores and flake tools). In our view, there is little if any continuity between Middle and Upper Palaeolithic assemblages. Generally, cultural complexes associated with anatomically modern humans appeared in the region around 40 000-50 000 <sup>14</sup>C BP. The appearance of art at that time in Siberia (Denisova Cave, Khotyk, Kamenka-A, Podzvonkaya...) indicates an origin of symbolic behaviour in Siberia much earlier than previously thought.



## ROCK ART DATING IN AUSTRALIA AND BEYOND:

### What Does it Tell us?

**Paul S.C. TAÇON, Michelle C. LANGLEY**

One of the biggest challenges in rock art research is accurate and reliable dating. A related issue is that of interpretation – what do the numbers obtained really mean? In our paper we briefly reviewed the results of rock art dating programs in Australia with those undertaken in other parts of the world, summarizing and analyzing over 700 rock art direct dating results. We identified a number of common problems arising from the results as well as patterning related to taphonomy and cultural difference. We also observed some common trends, both in terms of temporal and spatial rock art change and in terms of how dating results are (mis)interpreted. A particular question that focused discussion is whether there is a case for Pleistocene figurative art outside Europe and, if not, why it developed to such a great extent elsewhere during the Holocene.

This was a preliminary analysis that, although comprehensive and representative, does not yet include every dating result in the dataset. Furthermore, many new results were announced at the 2010 IFRAO Congress and are in press, as are others from various parts of the world. Indeed, the direct dating of rock art is increasing at a rapid pace so that databases need to be continually updated. Thus we provided only a snapshot at the Congress and do not include a full paper in the Proceedings. It is planned that a more comprehensive database and analysis be published later. However, an interesting result to date is that only paintings from 11 cave sites (7 in France and 4 in Spain) have been reliably dated to the Pleistocene.

We conclude that the direct dating of rock art is still in its early stages, that results to date have produced a skewed picture of the past and that we are still not in a position to reliably construct let alone compare accurate chronologies from different parts of the globe. This is not to suggest that such comparisons are futile or that they will not be possible in the future. On the contrary, the construction of robust chronologies is a priority for global rock art research. However, current dating methods need to be challenged, refined and cross-checked against each other whenever and wherever possible. New techniques need to be invented and new forms of technology employed.

New ways of comparing rock art from one region to another also need to be developed in order to bring rigor and validity to such exercises. In this regard new insights from neuroscience research into rock art could be used as a control in such comparative studies, especially for naturalistic figurative imagery.

For decades the majority of researchers have argued that naturalistic figurative imagery first arose in Europe, over 30 000 years ago, and then somehow spread to other parts of the globe. Others contend it arose at different times in different places. Our research suggests that although ancient naturalistic figurative rock art certainly has survived longer in Europe, there are good taphonomic reasons why this is the case. Furthermore, direct and indirect dating from various



Patrick Lamilami and Paul S. C. Taçon sampling beeswax design for dating (Wellington Range, Arnhem Land, 2009).

parts of the world suggests there is some Pleistocene naturalistic figurative rock art in isolated areas (e.g. parts of northern Australia, Timor, possibly northwest Yunnan, China, some parts of India and Africa) but that our knowledge of its age is obscured by our current state of dating technology.

Despite taphonomic processes having a greater impact the further we go back in time, the use of naturalistic figurative imagery increased substantially during the Holocene across the world. Some of this is a reflection of population growth but with great environmental change the usefulness of such imagery as a communication device would certainly be important, if not essential, for survival. Aspects of economy, identity, spirituality, relationships to land, relationships to other creatures and relationships to other human groups would have all changed in extreme ways during the Pleistocene-Holocene transition and beyond. Naturalistic figurative images would have played many roles, mediating and expressing change as well as reaffirming the past in order to assist with decisions about the future.

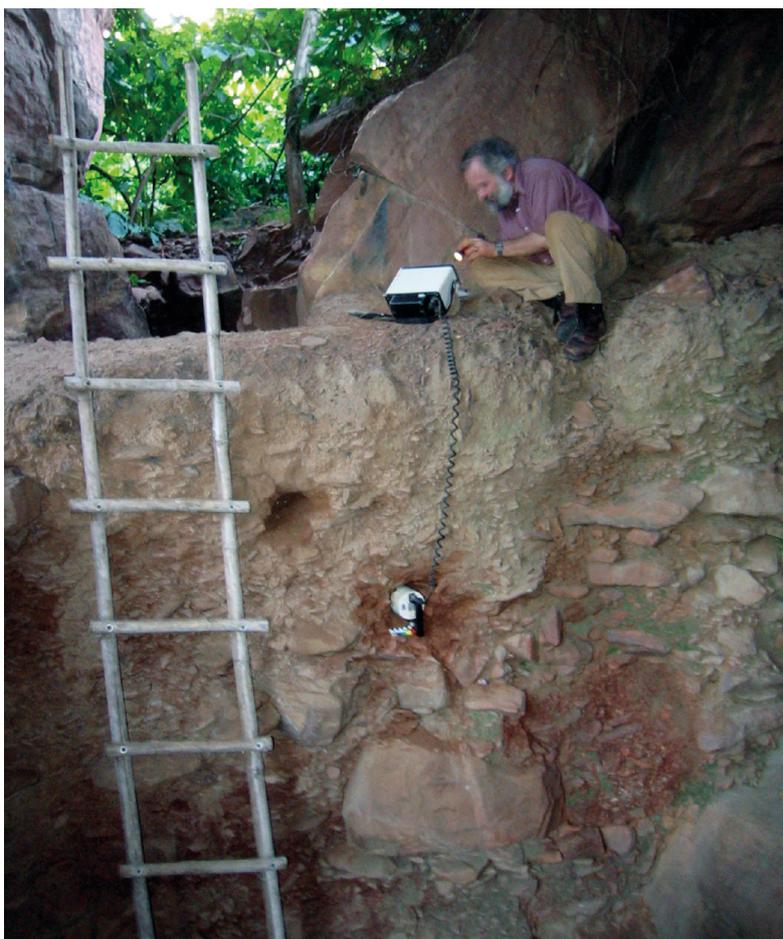
Thus the picture that is emerging is not a simple one. Old naturalistic art has survived best in Europe. Neuroscience tells us all modern human groups had the capacity to produce naturalistic figurative imagery. Taphonomy has affected the survival of old art in detrimental ways outside limestone caves and outside Europe. The state of rock art dating technology in many ways is still experimental and limited. Much interpretation remains speculative. The true picture is likely much more complex than we envision.



## THE DIFFICULTIES OF DETERMINING THE APPROXIMATE ANTIQUITY OF LOWER PALAEO LITHIC PETROGLYPHS IN INDIA

Giriraj KUMAR, Robert G. BEDNARIK

The EIP Project has produced unambiguous evidence of Lower Palaeolithic petroglyphs in the excavations at Bhimbetka and Daraki-Chattan in central India. In order to obtain absolute dates, efforts have been made, through IFRAO and involving Indian and Australian scientists, to meet the challenge since 2001. We have tried OSL dating of the sediments from the excavated sections at both sites, AMS  $^{14}\text{C}$  dating of amorphous silica, U-Th series dating of ferromanganese accretions deposited on petroglyphs and stratified boulders and microerosion dating of cupules. We encountered a variety of problems while employing these methods and could not obtain satisfactory results.



Robert G. Bednarik recording the radiometric measurements  
in the process of sample collection for OSL Dating from V.N. Misra's trench at Bhimbetka.

So far we have only secured minimum ages, some of which are extremely conservative. We have not determined the actual time of the execution of the petroglyphs, which according to the distribution of exfoliated rock slabs with detached cupules and the presence of the cupule-making hammerstones in the Oldowan-like industry must be of Lower Palaeolithic provenience. So the obtained minimum dates are irrelevant, particularly in the case of Daraki-Chattan. The only satisfactory result is a conservative indication that the Lower Palaeolithic petroglyphs at Bhimbetka are much older than 100 ka.

Secondly, the laboratories analyzing materials such as accretions can give estimations of the ages of such features directly related to the rock art, but not the actual date of the artefact in question. Hence, scientists working on obtaining dates for Lower Palaeolithic petroglyphs have to consider many complicating factors. With increasing antiquity of the art object or artefact, taphonomic issues become more crucial and must be clarified properly. The possibility of survival and finding evidence of palaeoart activity of such great antiquity becomes incredibly remote with increasing age.

Further, in any such dating endeavours we have to make sure that we are studying the original ancient surface of a petroglyph, which is almost impossible in the present case, or in the case of an exfoliating surface. In Daraki-Chattan the surface has experienced a regular series of deposition and micro-exfoliation as well as largescale exfoliating through insolation. These processes are continuing today. Finally, all radiometric dating methods are subject to specific sets of qualifications and limitations; they provide scientific propositions, not factual age information, and always need to be tested.

Our efforts to use various dating methods in this regard have failed so far, particularly at Daraki-Chattan. As rock art scientists we have to continue our efforts of exploring and try other methods in future. We are awaiting the results of the U-Th method and we are exploring the possibility of using the  $^{26}\text{Al}$ - $^{10}\text{Be}$  cosmogenic method. Until satisfactory results can be secured we can only rely on the traditional archaeological evidence we have obtained, which unambiguously demonstrates the Lower Palaeolithic antiquity of these cupules.





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