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Intuition and analysis in the recording, interpretation and public translation of Neolithic engraved signs in western France

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A B S T R A C T

We must distinguish between two profoundly different ways of knowing a thing. The first implies that we go around that thing; the second, that we enter into it. The first depends on the observer's point of view and on the symbols that are used to express that point of view. The second does not adopt any point of view, nor does it rely on any symbol. One could say that the first knowledge stops at the relative, whereas the second, where possible, achieves the absolute. Consequently, the act of interpreting a prehistoric carving/painting on a standing stone or on a boulder demands the generous use of language: on the one hand, the language of science, which is dominated by the symbol of equality, and where each term can be replaced by others; and on the other hand, by the lyrical language, where each term is irreplaceable and can only be repeated.

But the language of science cannot be anchored within an archaeological reality that is distorted by a poorly-controlled process of information acquisition. We must adopt an approach, both in the field and in the laboratory, which allows one to reproduce an experience and which takes account of our choices and our initial interpretations in the graphic representation of the painted or engraved signs, through the implemented sensors. This contribution will showcase the use of an approach that integrates several digital methods and allows us to progress the archaeology of images. It both shares and accumulates our information base and our knowledge, proceeding as it does on a basis that is epistemologically renewed.

The conference in which we were invited to take part centred on two main topics: “documenting art” and, in the subtitle, “recording techniques.” This duality is necessary: it focuses clearly both on a classical object of study and on the means which, we hope, can help us transform it into a subject of state-of-the-art research: digital technology. We would therefore like to build on the relationships between these two topics and propose a process of reflection which, rather than being limited to the means of recording and representation, should show why taking technology as a starting point, even as *the* starting point, is not expedient. Of course we all appreciate that, in a multi-disciplinary research programme, one phase should not take precedence over the others, but there is a need to re-think this epistemological requirement from time to time.

In this context, the “interpretation” of a support, an engraving or a painting, is not something that should take place only at the final stage of the archaeological study of a work of art: we must, rather, insist on the importance of the interpretative frame for approaching the object in question, even before we begin recording it with digital or geometrical tools.

We will start by describing in greater detail the challenge posed by the use of the two types of language which are indispensable for a proper understanding of parietal art and, indeed, of all symbolic productions originating in ancient times: lyrical language and scientific language.

1. The absolute and the relative

“...The relative is in science; the definitive is in art...”

“... You can turn back in time through the centuries, but not turn back in art. Masterpieces are on one level, all of them, that of the absolute...”

(Hugo, 1864: 14, 17).

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These few sentences from Victor Hugo's essay on William Shakespeare give us the essence of the distinction made by philosophers between two profoundly different ways of knowing a thing: The first one would be to circumscribe this thing; the second, to penetrate it. The first one depends on one's standpoint and on the symbols through which the thing may be described. The second one is not attached to any particular standpoint and does not rest on any symbols. The first type of knowledge could be said to be relative, whereas the second one, whenever it is given, would have attained the absolute (Bergson, 1903: 98).

Let us take as an example a duck gliding on the river Cam. The observer's perception of this object will be different depending on their standpoint – or whether they are themselves in movement – and will be expressed differently, according to the associated system of axes or points of reference, that is to say, according to the symbols we use to translate it. We would call this movement relative for two reasons: in the first case, as well as in the second one, the observer remains outside the object being observed.

The concept of absolute movement, on the other hand, would imply that we attribute to the moving object – the gliding duck, or maybe a silent boat – an inner, animate, sentient being. Further, that we can sympathise with its inner states and that our imagination allows us to experience them. Therefore, the absolute can only be attained through intuition, while every other approach is based on analysis.

- Intuition is the kind of sympathy giving us insight into the inner life of an object or a being and therefore knowledge of what it is that makes it unique and thus irreplaceable.
- Analysis, on the contrary, is a procedure relating the object to characteristics which are already known, that is to say, such characteristics as the object may have in common with other objects. To analyse is therefore to express a thing in terms of what it is not. Thus every analysis is a translation, an unfolding through symbols, a representation based on successive standpoints where connections have been found between the new object (the one under study) and others deemed to be already known. (Bergson, 1903: 100).

It is well-known that empiricism in archaeology, specifically in the field of the archaeology of images, all too often limits itself to seeking the original in the translation – where it can, of course, not be found; empiricism then goes on to deny that the original exists, on the basis that it cannot be found in the translation. This must result in negations which, if one looks at them closely, simply mean that analysis is not intuition. (Bergson, 1903: 107).

We may add that, however much abstract ideas may be useful for analysis – for a scientific study of the object as it relates to all other objects – they are nevertheless incapable of replacing intuition, that is to say, the metaphysical investigation of the object in its essence and uniqueness. Moreover, this is all the more important when the object of study is what we call parietal art or rock art: images without words from a distant past.

2. Lyrical language and scientific language

“...Let us point out a radical difference between Art and Science: Science is perfectible; Art is not...”

“...Pascal the savant is outrun; Pascal the writer is not...”
(Hugo, 1864: 14, 29).

Returning to Victor Hugo, who was a writer and a poet, it is clear that he was already aware of how, with regard to antiquity and even in his day, many scientific theories had been overturned and many others were likely to be eventually overturned. Taking the 17th century physician and mathematician Pascal as an

example, Hugo emphasises that Pascal's outstanding literary legacy is unaffected by the passing of time or the accumulation of knowledge.

To interpret a prehistoric painting or engraving is therefore an act which will not easily blend these two languages (Servien, 1935; Deleuze, 1968):

- on the one hand, scientific language, dominated by the symbol of equality, and where each term can be replaced by others;
- on the other hand, lyrical language, where each term is irreplaceable and can only be repeated.

It is always possible to “represent” the repetition as an extreme resemblance or a perfect equivalence. But the fact that one can gradually pass from one thing to the other does not mean that there is no difference in the nature of the two things.

Having established this duality and attuned our thinking to it, we should turn to the interpretative frame and emphasise how important it is. As archaeologists, we are meant to capture and record engraved or painted images bearing this frame in mind, while always questioning the legitimacy of our expert interpretation. This is therefore a matter we should dwell on before proceeding to discuss recording techniques.

3. The interpretative frame

The original meaning of “to interpret” was to translate a text from one language into another and, by extension, to clarify, to try to explain what might be complex or ambiguous. Now that we also refer to “interpreting” parietal art, it would be useful to remember that, in linguistics, interpretation is the attribution of meaning to deep structure – semantic interpretation, or to surface structure – phonetics, for example. In archaeology, however, the meaning of interpretation ranges between giving one's personal meaning to a fact which does not have a self-evident explanation, and “acting a part,” by translating in one's own personal way the thinking of an author from the distant past, similarly to a musician who plays – interprets – a chaconne by Couperin. The latter type of interpretation is by no means restricted to historical times: Leroi-Gourhan (1992) remarked in 1974 that the prehistoric artist, by translating into images the movement of living creatures, individually or in groups, was using the only means then available to represent the passing of time.

Generally speaking, whenever we identify an object by recognising some of its characteristics, this process is anchored in an interpretative frame which determines both what type of object we are looking for and what kind of characteristics we might recognise it by. This applies to any object, be it a boat represented on a megalith or the petrographic origin of the support on which it was carved.

In brief, interpretative frames condition the results of scientific research in two stages:

- firstly, they predispose the segmentation and categorisation work through which certain portions of reality become identifiable and classifiable and which we perceive as variations amidst an influx of sensory data;
- secondly, interpretative frames lead us to notice certain correlations between these segments of reality and pre-dispose us to formulate a hypothesis regarding causality, or confirm an existing one, rather than others.

Scientific activity is therefore an enormous interpreting operation, since it is by means of interpretative work that we try to transform observed correlations into explanations of causality.

Moreover, it is by means of interpretative work that we endeavour to question pre-existing interpretations when the findings they have led to appear to be contestable.

At the second of these two stages, it would be much easier for a non-specialist to participate in an ongoing debate. When the focus of debate is evaluating the petrographic determination of the slab which bears an engraving, or the decimation of the point cloud of that slab, it would not be difficult to declare a non-specialist incompetent; however, any criticisms made by a non-specialist would receive more attention when they relate to the interpretative frames informing the interpretation and explanation of the results in question. It is therefore, undoubtedly, at the level of interpretative frames that the archaeology of images is most often questioned by itself, but also by social agents who seem, *a priori*, to be external to it.

In the case of the study of parietal art and other types of signs or symbols on containers, tissue, human and animal skins, etc., a good number of amateur archaeologists, or simply non-specialist observers, can completely change a point of view about the case under study. They can do this much more easily, at any rate, than if they were to comment on palaeogenetic studies of human populations, or on investigations about fatty-acid residue in the pottery made by such populations.

We should therefore introduce the idea of an interpretative debate before giving an example of how it enhances our approach.

4. The interpretative debate

The interpretative debate – as applied today in the field of literary studies – is an exercise in the collective construction of meaning, achieved by opening up a space where the participants are encouraged to formulate their own hypothesis about what a text might mean (Citton, 2013: 57).

At the end of the session, the trainer lists the main elements about which the participants were able to agree, but also the points about which they disagreed, trying to present – as neutrally as possible – the points of disagreement, the reasons mentioned by each opinion group and the conclusions which may be drawn from the differences in interpretation.

Let us imagine that we could bring together a number of people who were not specialists to look at several graphic signs from our European prehistory. The facilitator would give details of specific rules of the interpretative dispositive. Discussions would not be directly about the problems to be resolved, but about how acceptable or how unacceptable the participants find the formulations listed on the task worksheets. Each point of debate would either lead to a reformulation enabling a consensus among the participants, or demonstrate that no consensus is possible.

There are therefore three types of debate:

- *Deliberative debate*, concerning a problem which, we presume, can only have one solution: it will oppose understanding to lack of understanding, or will attempt to make the participants converge on a fair solution.
- *Speculative debate*, for its part, deals with questions which are deemed to be open to different – potentially contradictory – answers, trying to explore their strengths and weaknesses, their implications and the logic pursued by each one of them.
- A possible *interpretative debate* about parietal art would therefore alternate between the two types of debate outlined above.

It is in this context that the difference between *explaining* and *making explicit*, small as it seems, would be crucial (Citton, 2013: 108). The participants in an interpretative debate, all seen as being on an equal footing, would try to make explicit to each other the

meaning each one of them finds in a carved or painted sign. Instead of relegating some people to the role of receivers (for example, of an explanation, of theoretical or practical knowledge, of a type of expertise) given to them by someone else, this model assumes that every person can have something to propose to others, *a priori* on an equal footing with everyone else. The requirement to formulate clear and well-defined propositions is not a pre-condition for taking part in the debate, but is achieved by collective construction of shared competence.

It is this model which we set out to test, at the end of the 1990s, by canvassing the opinions of people not trained in our discipline about a well-known figure of the Armorican iconographic repertoire, the famous “Mother-Goddess” or “shield idol.” Since a naïve perception did not identify it as a woman or as a mother, who are meant to be recognisable by their beauty or their sexual attributes, the intuitive alternative was found to be the opposite: male attributes.

Three images of this motif, accompanied by fifteen pairs of antinomic concepts, printed on a paper worksheet, were distributed in 1998 to 389 students of subjects not related to archaeology (Cassen, 2000; Fig. 1). They were offered seven graded options to express their opinion, choosing from each pair of concepts. These pairs ranged from erotic to austere, masculine to feminine, sexual to non-sexual, violent to calm, etc...

The results, interpreted by factorial correspondence analysis, enabled us to distinguish three behavioural groups (Fig. 1).

- *Group A* is characterised by recognition of the sexual character of the figure. Here, the meaning extracted from the figure corresponds to a macroscopic register structured around a phallic symbol.
- *Group B* reacts strongly to the abstract representation of the motif, considers it meaningless and describes it using pejorative adjectives. The criteria of sexual interpretations are rejected.
- *Group C*, which is more heterogeneous, is made up of those who are in two minds. There is a tendency for the sex of the engraving to be assumed to be the opposite to the sex of the participant. This group associates comprehension of the figure with feminine characteristics. This is therefore the classical interpretation of the Mother-Goddess.

This paper will not deal further with the above results, which are rather outside its scope, but it seemed expedient to present the method in order to illustrate one possible way to pursue the interpretative debate.

Another example relying on intuition is of even greater relevance for our discussion of the use of recording techniques, which is to follow.

There is a familiar sign in Brittany – the “axe-plough” – whose denomination encompasses all that is suggested by Magritte's famous painting (Fig. 2). Without reconstructing the whole procedure, let us simply point out that this particular sign is only found, in Brittany, in littoral locations; that, on the support we are dealing with, this sign's size is considerably larger than that of any other sign; and that, by splitting up the image into several graphic units, it is possible to make out the animal's hump, sex, tail and blow: factors which led us to anticipate a different meaning (Cassen and Vaquero Lastres, 2000; Whittle, 2000). This is how a putative agricultural instrument turned into the animal most intrinsically representative of the Wild: the spermwhale.

When our 2000 paper concerning this change of paradigm was published, the engraving on the capstone of the Mané Lud dolmen, which had up to then been considered an anthropomorphic figure (Fig. 3), had not yet been recognised as it is today. But it was thanks to the recording techniques (rotating lighting and

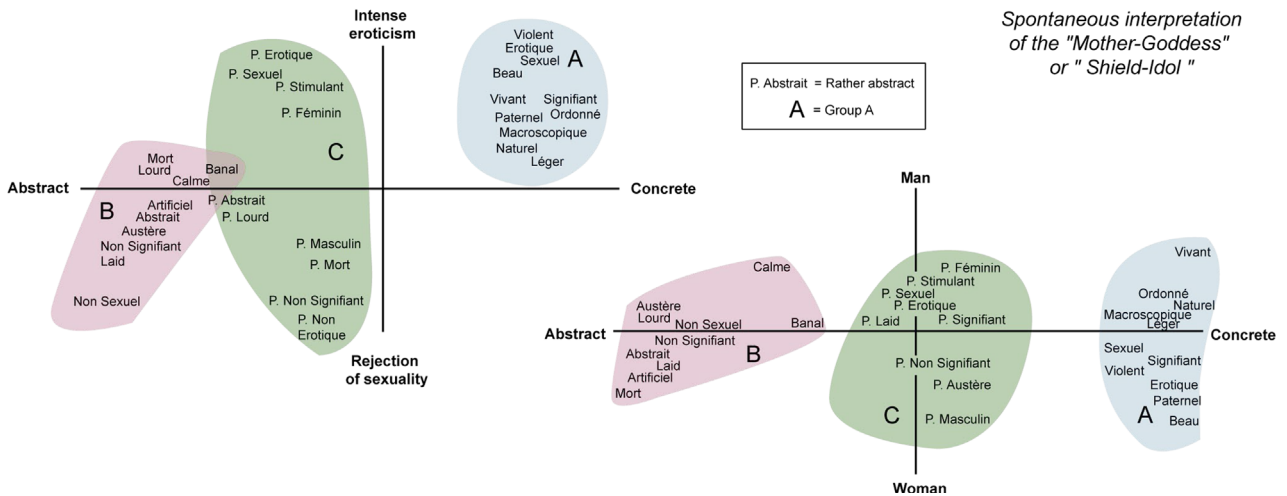
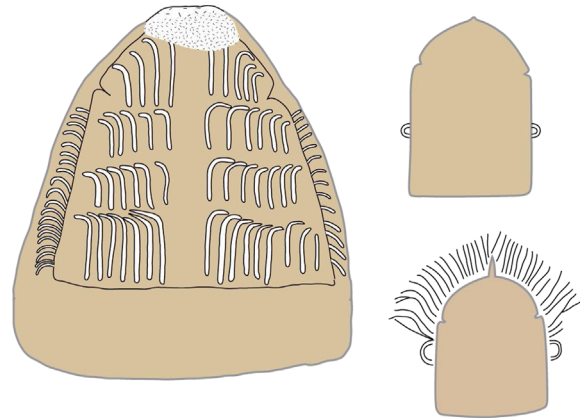
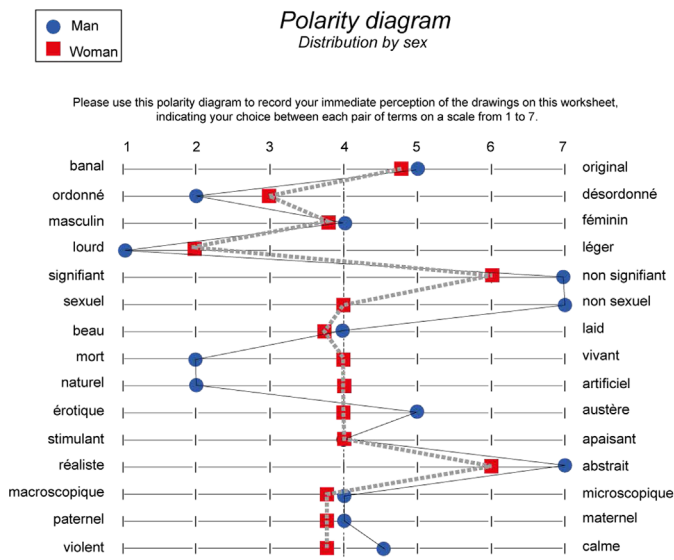


Fig. 1. Polarity diagram recording participants' spontaneous perception of the "mother-goddess" motif through a choice between pairs of terms on a scale from 1 to 7. Interpretation of 400 records using factorial correspondence analysis (after Cassen, 2000).

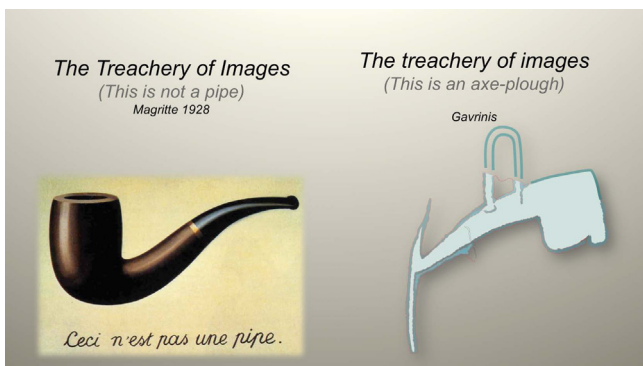


Fig. 2. Magritte's painting « The Treachery of Images – (Ceci n'est pas une pipe) » vis-à-vis the "Axe-plough" motif engraved on a slab at Gavrinis (Larmor, Baden – France). (Painting after Magritte 1929, © René Magritte Estate/Artists Rights Society, New York/ADAGP, Paris).

lasergrammetry) that the cetacean motif on the eroded orthostat was revealed, validating our hypothesis (Cassen et al. 2005). And yet, we must wonder whether we would have been able to visualise the animal in such a short period of time if our

interpretation (our intuition plus its elaboration) had not already influenced the way we planned the technical recording. There is no doubt that, if a successful recording of this slab had been made in the 19th to mid-20th centuries, it would have come as a great surprise, since even a child would recognise the "whale" in the very realistic drawing of the animal thus retrieved.

And now, let us turn to how we analyse objects through the process of recording them – a fundamental process in archaeology.

5. Analysis: the digital recording and representation of signs and their supports

5.1. Oblique and rotating lighting

Departing from the techniques used up to the mid-1990s – rubbing and direct tracing with a paper sheet - our initial method was to superimpose on a single axis digital photos taken with oblique and rotating lighting. By making a manual vector drawing of the transition zone between the lighted zone and the dark zone, it is possible to define an aspect of the carved line corresponding to a removal of material (pecked hollow lines, relief). The synthesis of different shots generates a graphic compilation; it is then that a

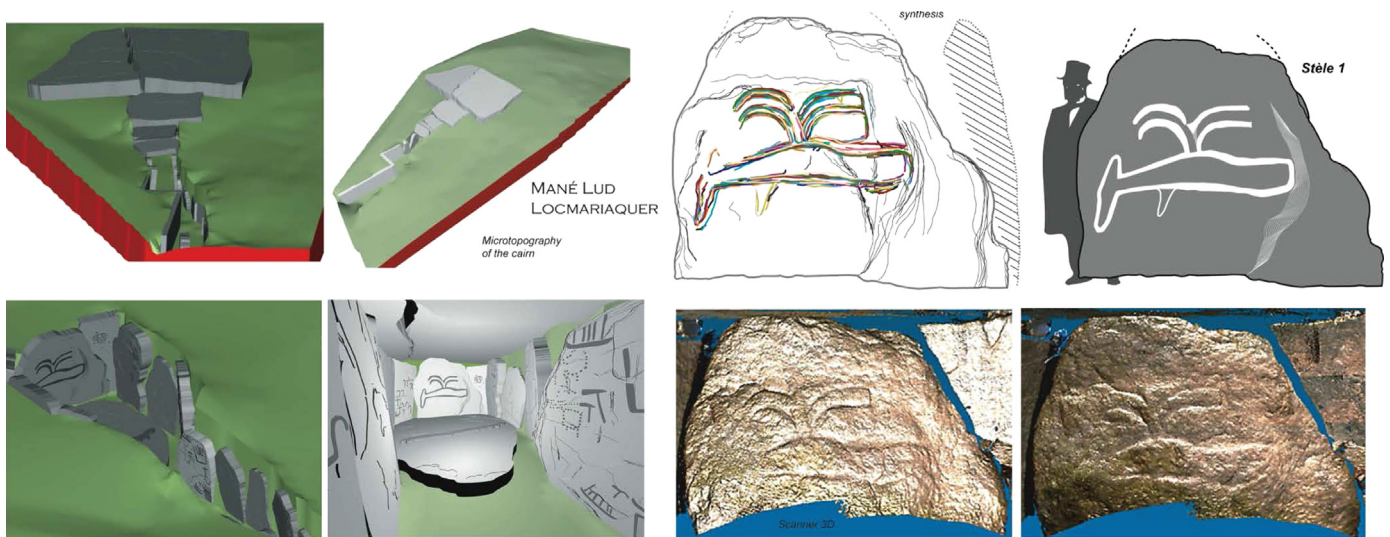


Fig. 3. The most realistically executed version of the sign previously interpreted as an “Axe-plough”: the Mané Lud sperm whale (Locmariaquer, France; after [Cassen et al. 2005](#)). Data obtained using lasergrammetry and photographs compiled under rotating lighting.

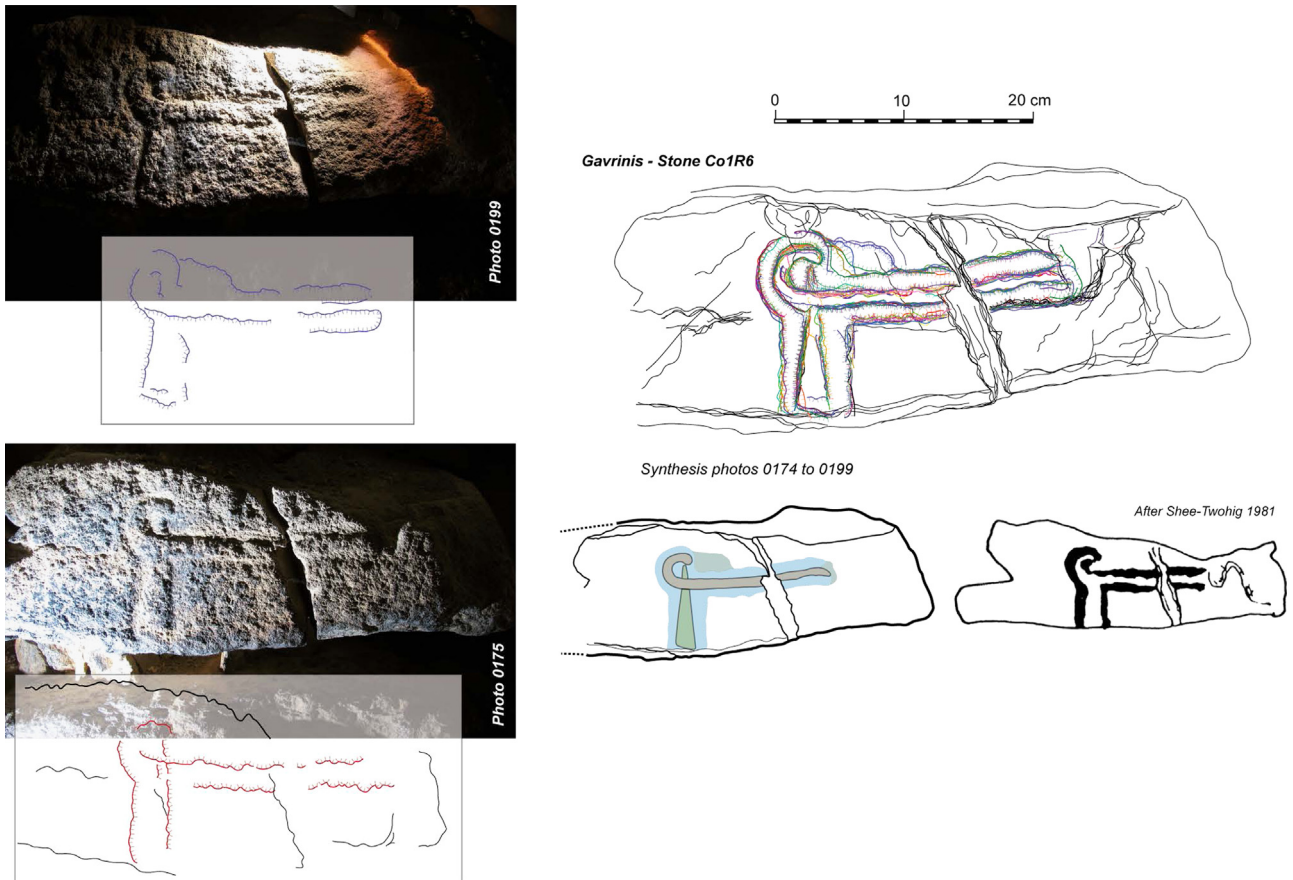


Fig. 4. One of the blocks at Gavrinis (Larmor-Baden, France) and the representation of a hafted axe. Comparison between an image obtained by tracing (after Shee-Twohig 1981) and one obtained by photographs compiled under rotating lighting.

choice is made of one contour among several, more or less concurrent, lines ([Boujot et al. 2000](#); [Cassen and Vaquero Lastres, 2003](#)). This is, of course, already an interpretation, but the more the variations of a carved line concur, the more likely it is that the recording is accurate, especially when dealing with eroded supports.

This method yields results of such precision, that previous recordings must be re-assessed in the light of the new data. In the

case of a figure as well-known as the axe Co1R6 at Gavrinis ([Fig. 4](#)), this method allows us to progress from a not very well defined axe blade to a type with a substantial inventory in the corpus of real objects. Moreover, it was precisely at Gavrinis that we realised the importance of the improvements made by Guillaume Robin in the orientation of the vector drawings, differentiating between the interior and the exterior of the sign ([Cassen and Robin, 2010](#)). Problems of the kind he had encountered in Ireland ([Robin, 2009](#)),

became crucial here in Brittany: we realised that they were identical on the stone surfaces at Gavrinis, where concentric signs juxtapose their edges very closely, so that whoever operates the recording equipment has trouble distinguishing between the background and the figure.

Ultimately, this method is significant in terms of scientific progress because it allows every new person undertaking a recording to refer to the existing database and make their own choices.

5.2. Three-dimensional digital recordings (point clouds)

Two further technologies have made welcome additions to our protocols on the surfaces of the Carnac megalithic monuments:

lasergrammetry, from 2004, and photogrammetry, from 2010. Thanks to them we have a reliable and reproducible method.

Using lasergrammetry we can easily use the point cloud we have obtained, submitting it to virtual oblique lighting on a computer. Several images taken in this way and then compiled can be processed according to the earlier method, that of drawing the contours chosen from among those available. (Fig. 5 A and D).

Yet another highly interesting method is the calculation of deviation maps (Fig. 5 B and C), which again enable us to draw the hollows in the carvings, (Lescop et al., 2013). We may briefly describe a deviation map as a superimposition and fusion of high and low-definition meshing. The difficulty here is to estimate the size of the deviation between two sets of meshing, although one

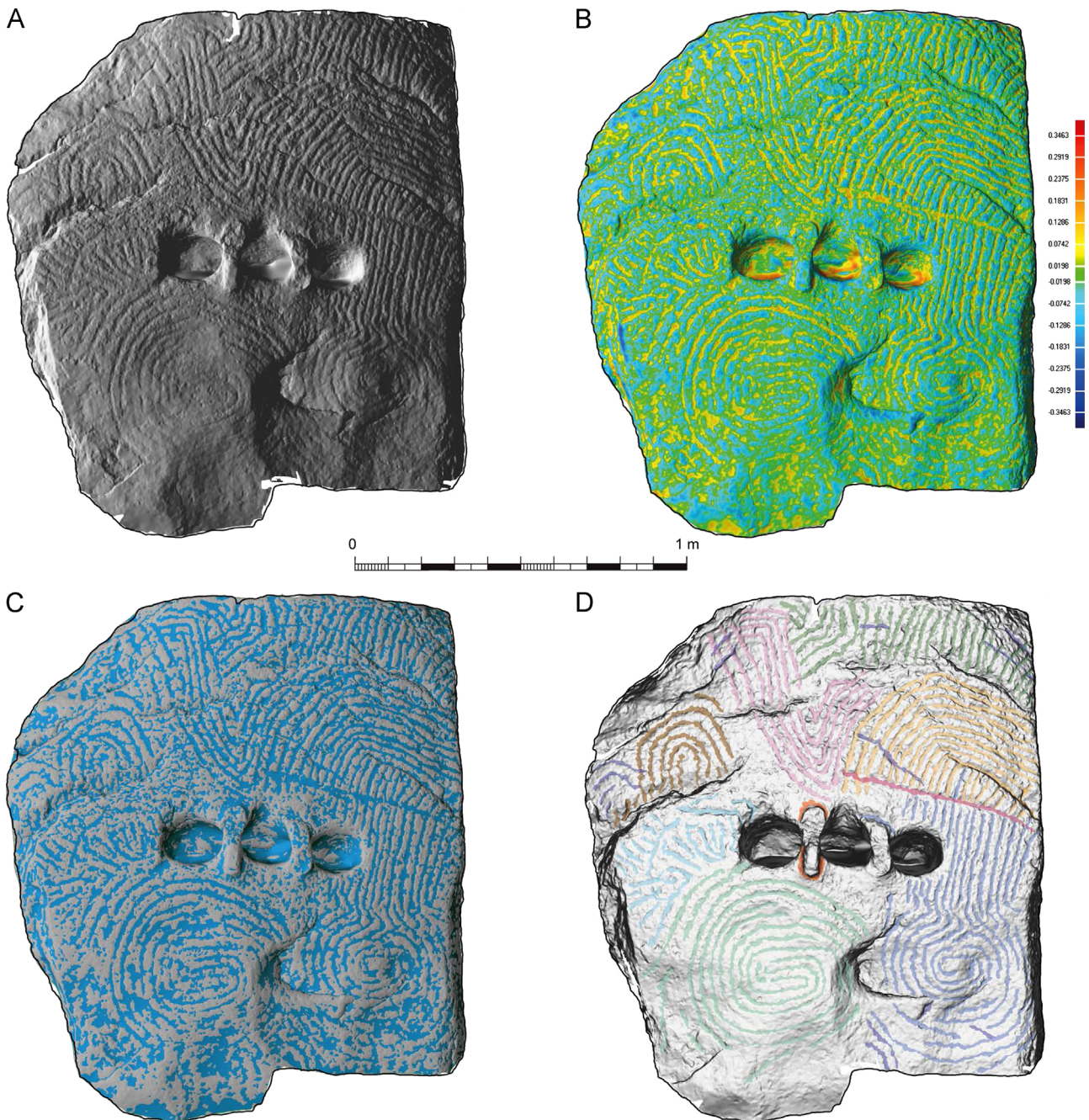


Fig. 5. Orthostat C3 (Gavrinis passage grave, Larmor-Baden, France): A- 3D model with virtual lateral oblique lighting (processed in Geomagic). B and C- Deviation maps (processed in Geomagic); colour code shows microtopographical differences between high resolution mesh and smoothed mesh of the point cloud; hollow pecked areas (engravings) are automatically identified and shown in yellow (B) and blue (C). D- 3D model (ambient occlusion, processed in Meshlab) with inclusion of engravings.

archaeological work on megaliths and their carvings or paintings. Cover slab P2 in the passage of the Gavrinis dolmen is a prime example in this context. It bears on one side a carving which one cannot record with a scanner given the lack of space – only a few centimetres separate this slab from the adjacent one. The conjunction of rotating lighting (but also with the light source only on one side of the photographic frame) and photogrammetry, have enabled us to obtain an unexpected frontal view (Fig. 6).

Furthermore, in cases when the support has become inaccessible because of restorations or vandalism, older castings can be used to complete the missing morphology, again through the use of oblique and rotating lighting as well as photogrammetry. The challenge here is to compile data showing different degrees of precision, obtained from disparate sources, in a single operational model (Grimaud et al., 2014).

5.3. Establishing relationships of anteriority and posteriority

We have found that 3D models have allowed us to superimpose the vectorised contours of the engravings, photographed with oblique lighting, on the three-dimensional morphology of the supports by matching the procedure to the geometry of the latter.

We have therefore become better able to establish the anteriority and posteriority of the carved lines, and therefore to make progress in the chronography of the signs and, ultimately, in visualising the intentions of their creator. Four practical possibilities to make a chronological reconstruction are visually accessible, for example on a deviation map, and they vary from intersection to avoidance (Cassen et al., 2014). Our experience has shown, however, that rotating lighting yields the greatest number of results, which are also the most complete ones if there is a large number of shots. The time required

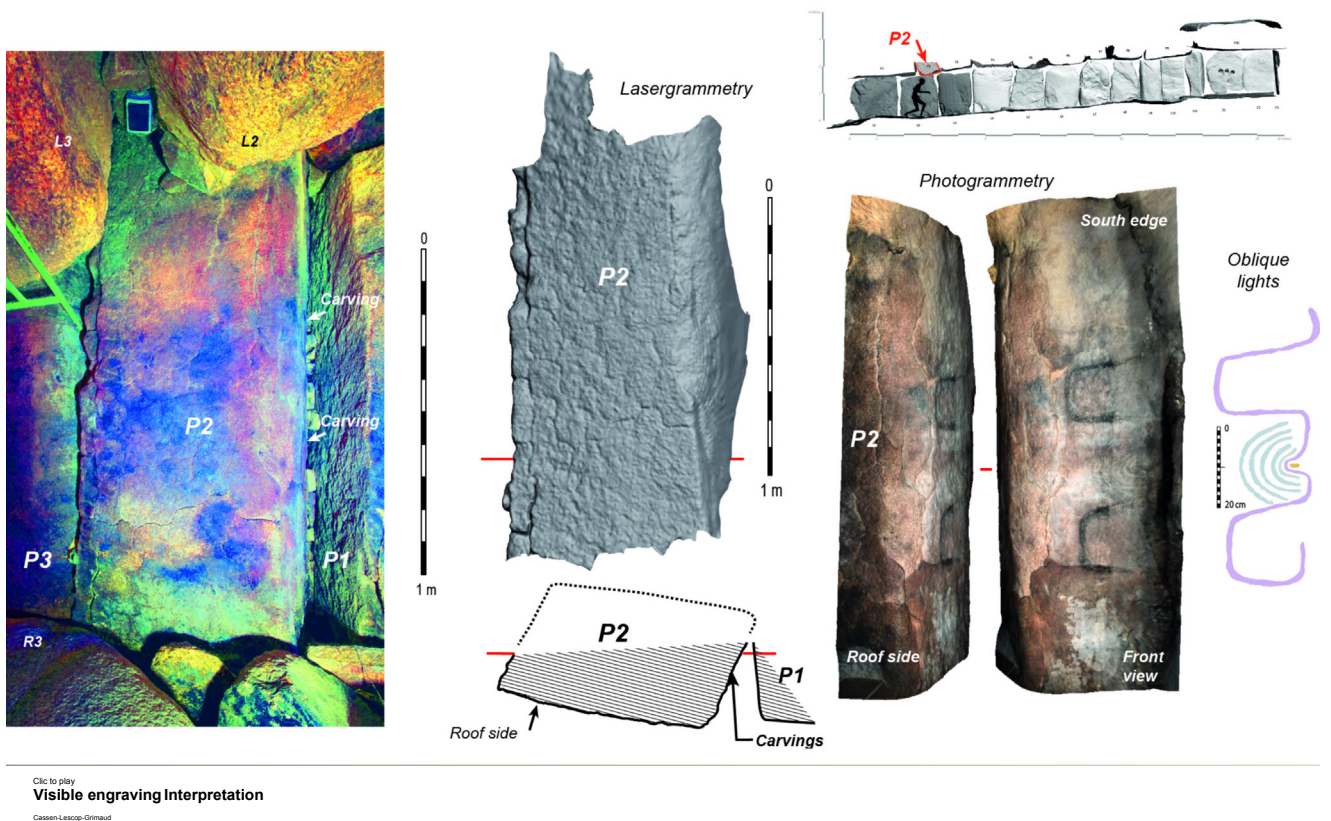


Fig. 6. Cover slab P2 (Gavrinis). Surface recorded by lasergrammetry and photogrammetry, engravings recorded by oblique lighting; 3D image enabling transition from a roof-side to a frontal view, not visible to observers visiting the site; click also on "Interpretation" to make the signs appear.

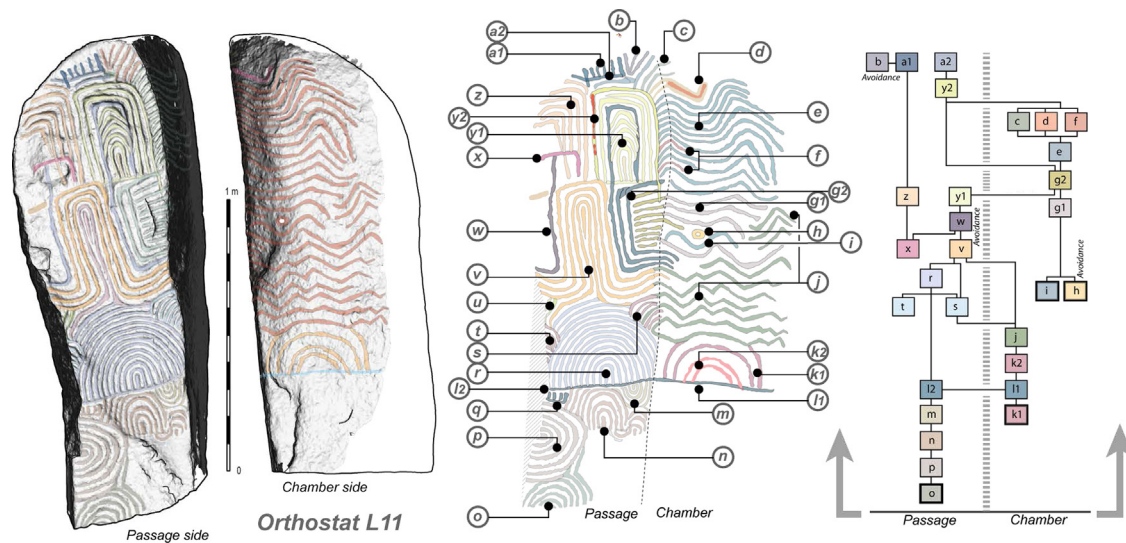


Fig. 7. Orthostat L11 (Gavrinis), marking the transition between the passage and the chamber. Inventory and identification of signs; links and correspondence between the two faces; recapitulative stratigraphic matrix.

chronological reconstruction are visually accessible, for example on a deviation map, and they vary from intersection to avoidance (Cassen et al., 2014). Our experience has shown, however, that rotating lighting yields the greatest number of results, which are also the most complete ones if there is a large number of shots. The time required to make manual transfers to the graphic palette is nevertheless considerable (5–7 h for approximately forty photos in the case of a simple composition; 210 h for a slab as complex as L6 at Gavrinis, a support 1,5 m high which bears 63 linear metres of engravings!).

We are certain that all these engravings follow a semiotic order, the signs being, by definition, linked by relationships of oppositions and correlations, probably with an underlying story, myth, prayer ritual. We do not actually know what the precedence and hierarchy between the signs, or the divisions of the screen's surface, mean. But we now know that they exist and that they generate a particular dynamism; that they have a beginning and an end, a lower and an upper side.

Slab L11 at Gavrinis presented us with yet another difficulty, since two engraved surfaces meet at the junction between the passage space and that of the chamber. Each surface must therefore be appreciated in its own context, but then confronted with the adjoining one, insofar as iconographic out-of-field effects are created (in the cinematographic sense – Cassen, 2011) which are relevant for their interpretation. Building a stratigraphic matrix thus becomes an indispensable stage of the chronographic method to disentangle the interlinked strands (Fig. 7).

5.4. Colour image enhancement

In cases where the support is very hard (sandstone or ore quartz), we found that colour image enhancement, also based on digital photography, is indispensable for the techniques described above, since on hard stone it is not possible to produce the hollow lines usually obtained by pecking on softer rock types (granites, schists, limestones). The plug-in DStretch of the software ImageJ (Harman, 2005) has thus come to be used more and more frequently in the study of parietal paintings (Gunn et al., 2010), and its application to barely visible engravings on the surfaces at Gavrinis (in sandstone and quartz) has also yielded remarkable results (Cassen et al., 2014). In this instance too, the manipulation of several colour spaces generate different images of the carvings which one can then cut out and compile following the principle used with rotating lighting.

6. Conclusion

By ensuring that the percepts refined by science and the concepts invented by philosophy or anthropology remain in continuous dialogue, archaeological practices and studies dedicated to parietal art might ultimately be able to elucidate the ways in which we are affected by percepts and concepts. They affect us to the point where they interfere not only with the choice of techniques for recording the object, but also with its graphic rendering.

The artist, yesterday as today, creates percepts, builds a set of perceptions and sensations which survive those who experience them. The philosopher creates concepts to solve problems. To create is to have an idea, not to give an opinion. Archaeological research of images runs along these two paths: intuition (percepts) and analysis (concepts). Writing or reading poetry, telling stories or listening to them, making music or listening to it, making films or developing the ideas that inform the creation of a film, all of this helps us to develop our affects (emotion, feelings, passion, desire, fears) which influence how we orient ourselves in the stream of data and in the framing choices we are constantly receiving from all directions.

It would be quite legitimate to criticise the specification of the above three pathways for failing to acknowledge the complexity of the tasks accomplished by scientists, philosophers and lovers of art. Scientists do not just register perceptive data, but try to interpret it as well. Philosophers do not conceptualise with their eyes closed. And people who are seriously interested in art must simultaneously perceive and conceptualise, if they are to develop affects which are more than mere hallucinations. And yet, a counter-argument to this would be that we should at one and the same time, or in stages, be scientists, philosophers and lovers of art (Bergson, 1911; Citton, 2013).

An archaeologist studying representations must, of course, be able to go through such an apprenticeship and be active in these different roles. After all, as Descola (2005) reminds us, a person who is a naturalist when reasoning on the basis of scientific data becomes an animist when he talks to his cat, an analogist when he checks his horoscope, and a totemist when he brings flowers to the grave of his dear departed.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.daach.2015.02.002>.

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