Understanding prehistoric images in the post-historic age: A cognitive project

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The reappropriation of the past in the post-historic age results in vernacular interpretations. History and prehistory are continuously 'democratized', opportunistically reconstituted according to a teleology more of commerce, which implies vulgarization, than of relevant knowledge. Petroglyphs and rock paintings (after, or along with, dinosaurs) could not escape this destiny. Declared early on as works of art, the best known became objects of speculative writing and procession sites. One could not exactly collect them, but if this had been possible, we would have major collectors inviting us to their caves, and many art dealers authenticating a new 'unique' work with which the owner has to part because of the recession (or whatever other lucrative reason). When some of the procession sites had to be closed due to damage inflicted by indiscriminate visiting practices, simili — Lascaux II is the best known — were built in the environs, and the lesser known sites took their place. It would be arrogant and self-defeating to see in the ever increasing popular interest in these 'messages' from our ancestors only the consumer aspect (as strong as this actually is). It might be that 'only the wrong people travel', at least if we consider the increasing number of sites vandalized and the tour packages offered by the tourist industry. Layers over layers of graffiti complete and cover early images, detracting from the primary significance of such places. But once on record, these added signs become part of the context, testimony to something else, but nevertheless testimony of a sort. To this 'voluntary contribution' of the new geniuses of graffiti, one ought to add the involuntary contribution of pollution, as well as the action of natural elements (wind, rain, seasonal variations, etc.). In short, what happened with the original expression over many thousands of years continues to happen, but so much faster, as we make progress in understanding this almost irresistible urge humans have to leave a mark. At times, it seems that a contest is taking place: factors of disintegration vs. the urge to know and preserve. Acknowledging various ways in which petroglyphs are appropriated — by populations still connected to them,

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by experts, casual visitors, new 'artists', the tourism industry, etc. — we actually realized their intrinsic contextual condition, and thus their unfolding polyfunctionality. And so a question begs our attention from the very outset: can we approach prehistoric images in the post-historic age free of the structural determinations of this age?

As the reader must undoubtedly have noticed, the question is not whether we can achieve a state of *tabula rasa* — the naive notion we inherited from the empiricists — in regard to prehistoric images, but rather if the pragmatic context of the post-historic does not preclude the reconstitution of a cognitive state rooted in human experiences to which we have fundamentally lost connection. (Some might even wonder why we would try, since to understand means to relate to new circumstances.) Implicit in the question is the premise that without entertaining the *Why*? question — why did our ancestors express themselves through the images under discussion — i.e., without placing the subject in the pragmatic context, we have little (if any) hope of advancing hypotheses regarding petroglyphs (and all other images belonging to the same subject matter).

The path of abduction

Scholars from many other fields can, and frequently did, define the materials used, the characteristics of the arms and hands, even fingers, involved. They inferred from petroglyphs and paintings to characteristics of the species (at the time those images were produced) such as height, position of the body, properties of the eyes (better night vision than we have today, for instance), relative weight of the head in respect to the rest of the body, etc. As recently as 1990–91, French scientists (Jean Clottes, Dominique Buisson, Michel Menn, Phillipe Walter), applying chemical analytic techniques to small samples of paint used in the Pyrenees area, determined the age of images on cave walls. The 12,000 to 14,000 years they established is probably less important than the observation of variation of ingredients, and moreover, of successive individuals at work. Like the majority of other researchers, they followed a primarily deductive path of reasoning. The same was applied in describing the possible function of the images examined.

Our interest runs in a different direction, for which deductive reasoning (or induction, for that matter) is less appropriate. After all, it is highly unlikely that we will be able to state univocally, based on deductions or logical inductions, whether a certain glyph is notational (hunting tally, for instance), representational (human calendar), or part of a convention of writing, or even, as many assert, an aesthetic convention. For the

majority of sites on record, we simply do not know whether images result from a single experience (single sitting), or from accumulated instances (such as those documented at Niaux), from reuse over time. The entire body of work carries with it, in endless diversity, remains of a remote past to which we try to reconnect in order to better understand ourselves. In order to gain access to what is, intentionally or accidentally, encoded in those remains, we need first to have a detailed account of everything pertinent to the subject. As an expression of the human beings constituting their own identity in the act of painting with fingers and hands, or of physically carving (or whatever the action was) into stone, wood, on horns, etc., the petroglyph (and to the same extent the geoglyph, to which I shall return) encodes not so much messages as functions. Some of the known images are anthropomorphic, others zoomorphic; some relate to the world of plants, to the sky, to the landscape. Many are geometric. Inductive reasoning associated them with a variety of higher-level human activities: notation, mathematical image of the world, numbers or even a calculation system, rhythmic support for ritual-oriented activity, depiction of shamans' trance experiences, and so on.

The visitor to the Altamira, Niaux, or Lascaux caves definitely stands before entities different from those in the Valley of Fire (Nevada), at the banks of the Tam', Angara, and Lena rivers (in the Siberian taiga), the many aboriginal depictions in South Africa and Australia, or the inscriptions at the entrance of the Nuragic caves (in Sardinia). In the Vince (an area around Belgrad) notation, some identified geometry, others ritualistic signs, and most recently, some even identified the beginning of writing — in 229 letters (Haarmann 1990). Different pragmatic needs resulted in different forms of expression, impossible to understand correctly outside the context of their necessity. What became known as 'cave paintings' — and I am quite reluctant to use this qualifier — are usually sequences of animal representations: bison, horses (some with beards), deer, ibex, bighorn sheep. They constitute an image of a coherent universe of life influenced by geography and weather conditions. But before reaching this higher level of semioticity, they are indexical signs — the orientation of the chosen wall, the topology of the stone, and the way the physical is integrated into the new image are part of their semiotic condition. Anthropologists considering the petroglyphs point to what they encode: measures of human interaction with nature. They also reflect a particular type of knowledge: substances mixed, tools used, selection of particular sites where the image was naturally preserved. They all enforce the argument in favor of understanding petroglyphs as indexical signs.

In search of the beginnings of human visual expression, we cannot rely

exclusively on deduction because the 'coin' we examine has only one side preserved. The reverse — what made those prehistoric ancestors commit their energy and expressive power to the surfaces used for their notation — is only a matter of hypothesis (i.e., abduction). We expect to proceed from the coherence of the image and the implicit assumption of the coherence of its author (or authors) to that of the activity that made it possible and, finally, necessary. (The categories of possibility, reality, and necessity are evidently used in the sense Peirce defined them within his broader philosophic system.)

Many hypotheses have been formulated since the moment people first started their journey back in time under the guidance of the various testimonies to their ancestors. It is probably time to proceed toward a broad base of interpretations in order to extract from them themes of interest, patterns of questioning, and families of accepted interpretations. Even before constituting a vast database of images, we could, relatively economically, identify the entire body of interpretive work, classify it (from descriptive, accidental, to analytic, systematic), and perform intelligent evaluations of the many viewpoints advanced. An intellectual map of everything pertinent to the subject, testimony to proven, or suspected, or even fake descendants of those who expressed themselves in the glyphs, would certainly guide us in the effort of actual cataloguing, as well as in measuring significant aspects and quantifying them for comparative studies.

The scale of existence and the scale of expression (so different in petroglyphs and geoglyphs) are in tight connection. The economy of means which was unanimously noticed, corresponds to the economy implicit in the practical experiences leading to the pragmatic necessity of the expression in petroglyphs or other types of prehistoric images. This means that we face the challenge of establishing this scale. Iconic representations and various archaeological findings will help relate the represented to those anatomic characteristics that changed quite a lot in the process of natural selection. In the case of geometric (or decorative) elements, the relation to scale is more subtle. What needs to be consistently considered is the fact that no image, regardless of whether it is portable or stationary, can be interpreted free of its many connections to the place and time of origin. We know from many populations related to glyphs through their culture that they always perceive them in unity with the world in which they live. Middle Eastern testimony is impressively coherent; so are the remnants defining a Cretan zone, a Chinese or an Indian visual universe indebted to the specific practical activity through which people constituted their identity.

Probably the most appropriate abduction we can rely upon is that of

the Darwinian model, a major hypothesis regarding the evolution of everything that is living. From this perspective, petroglyphs are instruments for achieving fitness (the survival of the fittest means not only physical qualities but also cognitive characteristics augmenting the physical, opening new ways for its unfolding in practical experiences), and thus they are, on their own terms, instruments for survival. This function slowly changed over time. Stabilizing functions became progressively more important, and further improvement of the individual and the species were reflected in new images. But the mechanism of the emergence of expression through images, as well as that of its further differentiation, is structured by this primordial function. The abductive path suggested might be challenged by other models. To preempt this possibility would be epistemological suicide. The most important thing is not the confirmation of a principle, but the awareness that each hypothesis will be severely challenged by the factual reality of the images in question.

Efforts to establish a pragmatic perspective will not succeed unless we create means and methods appropriate to the subject and come up with procedures for testing their epistemological status. Knowing that petroglyphs and geoglyphs are expressions of human identity in variable contexts, we want to capture both self-identity (of those expressing themselves at a certain time) and variability (of circumstances). In short, how people learned from each other, and how one generation learned from another, are of particular interest.

Our goal could be to reconstitute structural dependencies in a simulated environment endowed with self-learning capabilities. Probably a neural network simulation, whose parameters remain to be determined, could achieve such a goal. Artificial intelligence procedures based on abduction have already proved to be powerful enough to support such practical applications as diagnostic (in the largest possible sense), polling, and even abductive reasoning, as this is applied in large automated systems.

Various pragmatic functions are reunited in the praxis of expression through petroglyphs. The variety under question cannot be rationalized away, even by the most spectacular hypotheses. In this research, especially coming from a semiotic perspective, we need to reestablish the context of syncretism. This is the major goal of the abductive method suggested. Details will follow when specifics of the program are presented.

These preliminary considerations cannot be satisfactorily concluded without saying that the entire subject needs to be understood not as a collection of artifacts, certainly seductive, but as *process*. Semioticians will immediately relate to semiosis. Appropriately so since, regardless of the perspective from which glyphs are considered, they are realizations in the unending dynamics of signs interpreted through ever newer signs.

There is, nevertheless, one unexpected reward: if the semiosis can be successfully defined, this could be a major breakthrough in 'reverse engineering' — how and when people constitute their identity in the identity of their signs. The unity between the natural condition of the semiotic animal, the emergent cultural self-definition, and the pragmatics making it necessary is embodied in the semiosis. Our task is to use means available today, *first* to establish a database of images and knowledge, and *second* to use computational models (algorithmic and non-algorithmic) in order to describe the process. Eventually, we will be able to simulate its dependence on the cognitive level attained by the originators of the primitive images now under scrutiny.

The experience of seeing

Looking at a tree, watching an animal run, experiencing the sunrise, and relating to the nightly skies are different from the experiences of seeing the image projected onto stone or carved into wood. The very complex nature of the visual convention involved in representation cannot be ignored. One can be forced to see something, persuaded, left alone to discover it, or enticed into sharing a convention behind which similar practical experiences are to be suspected. The emergence of the image corresponds to new emerging characteristics of the human being. The naturalness of seeing is very deceptive. In fact, we see only some aspects of any visible entity. Our experience 'continues' where some parts of the image are 'missing'. Color is dependent on light and texture; texture, once experienced (by touching), enhances the perception of contrast. Contexts of seeing are extremely discriminating. The same image looks different from hour to hour, month to month, season to season. The variation of the seen can very easily trigger associations and patterns of filtering the visual. A drawing on a rock is entirely absorbed in the sunny daylight. At night, moonlight is reflected, giving depth to the image. It very easily supports the appearance of life — the image wakes up at night and rests during the day. Scale affects integration of details, and definitely the perceived dimensionality of a visual representation. Where many realize only two dimensions, there is usually a third, but even more, there are the intermediate dimensions, which descriptions in fractal geometry embody so suggestively. In order to relate to the many layers of reality embodied in an image, we need to relate it to many plausible contexts of perception and interpretation.

What we see today is different from what anybody else saw before, and not only because physical factors have affected the material, or

because the eyes have changed (which is an acknowledged fact). Primarily everything we see, we see through what we, and our ancestors, have already experienced visually. Our eyes are not scanning devices sensitive to colors and shapes, or to contrast; they are part of a complex sensorial and cognitive system that can be understood only in its unity. We continuously change our way of seeing, our perspective, accumulating filter after filter, and prejudice after prejudice. Can we say that a very well-designed scanner will 'see' what the ancestors saw, since it is 'neutral', 'unaffected' by our entire visual history? The question is important because the more we learn about these images, the more we get caught in the semiosis of previous understandings. It is impossible to free oneself from oneself, and so to free a sign from those embodied in the sign. In short, to answer the question means to understand that various experiences in seeing — the culture of visual perception and the effective science we have built around it — are already integrated in our new 'electronic eyes', or in the software driving them. This is why the answer has two parts:

(A) No physical device is unaffected by our past experiences.

(B) A digital description of the physical properties of the petroglyphic image is the cleanest facsimile of the image.

The first part simply acknowledges that knowledge is domain specific. It instantiates data, extracted from a dynamics of continuous change, at a given instance. The second answer brings Leibniz's (1666 [1951]) voice into the discussion regarding which language, if any, can claim universality. His *characteristica universalis*, an ideal language in which signs stand for simple and unanalyzable concepts, associated with a *calculus ratiocinator*, would constitute an 'algebra of thought'. After these cultural qualifiers are spelled out, we still face a basic epistemological question: what do the two contradictory statements leave us with? In trying to answer this epistemological question, I have articulated a concrete semiotic program. *In nuce*, it says that a massive effort to scan all petroglyphs we are aware of would result in two desired results:

(1) preserve what can be still preserved (after so much was already lost and much more is in danger of disappearing or being vandalized, even with the best intentions); and

(2) constitute a body of images upon which we can project many explanatory models, images we can use for tests, modeling, and simulation; in parallel, constitute the knowledge base of explanations and theories pertinent to the subject.

But again, short of providing more details, and short of suggesting the complexity of the enterprise, the effort of scanning — or, for that matter, of filming, videotaping, or generating similies — is irrelevant, if not outright frivolous. It is common knowledge that the world has been

scanned, over and over, for resource identification (oil, minerals, forests, etc.), for meteorological data, for military and other reasons. The same means (incidentally quite sophisticated) can be mobilized for specifically focusing on petroglyphs and geoglyphs. At first glance, the enterprise would appear to be extremely expensive. Moreover, while other projects promise a tangible return (more sources of raw materials, better weather prediction, higher security), this is apparently in the category of science for the sake of science. Nevertheless, I submit that what is at stake is very important, probably as significant as research in physics and biophysics concerning the beginning of the universe, and even as relevant as the extremely costly and controversial human genome project. We ask what made the semiotic constitution of the human being possible, and even necessary. This is not a luxury, but a major entry point to our current major concerns: how is common sense established? What are the supporting structures of efficiency? How can we improve human life and work without giving up awareness of the world and the environment? Besides, concern with the very beginning of language and sign processes is concern with the human condition (Campbell 1985), partially reflected in the genetic endowment, but even moreso in the pragmatic dimension of human existence.

Justified as it is, such a project needs to be further driven by precise expectations. In order to confirm, for instance, or disprove some hypotheses regarding the function(s) of glyphs, experts have realized the need to get a closer look at the engraved lines, at incisions, at the notches and microcups visible on stone or on animal bones, on weathered eggshells dating from the Palaeolithic Age. They have started paying attention to the specific action through which images were entrusted into the matter that bore them over time. The direction of finger movement when it applied color is as important as the composition of the color, and probably the design. We can use precise 3-D scanning, combined with spectral analysis, to improve chronologies and to refine our findings regarding the composition of paints. Direction of movement, order of lines, type of tool, changes in tool, and the time required are important elements in filtering how an unfocused gesture is continued, how a beginning leads to the unfolding of a convention or gets exhausted prematurely. Already, computer-driven machines built for contour analysis have been applied in order to describe variations in tools, angles, and characteristics of notches (d'Enrico 1991: 83–90). A major concern is how to avoid, or diminish, the influence of the measuring device. The idea of a major scanning program needs to take all these elements into account. We know, for instance, that 'rubbings' of petroglyphs are causing granular attrition and even affecting the chemistry of the patinae. A piece of

thin, damp cloth (a method used for many years at various sites) reflects the image, but disappears as the cloth dries. And what about those glyphs that are visible only on certain nights? The suggestion made needs to be ecologically refined in order to meet all reasonable expectations. Electron microscopes with x-ray attachments and mass spectrometers conceived to separate and identify components in minuscule samples have already returned important data. Such data needs to be integrated in the digital world suggested (for instance, through scanning electron microscopy). If implemented, such an integrated world would open a new perspective — computational studies of the incipient sign activity of the species.

In direct connection to the above, the following thesis can be submitted: computational theories become progressively dominant because they result from the use of powerful tools that allow us to consider aspects of phenomena that until now were either abstracted away or reduced so that we could cope with them.

This thesis can be understood only in direct connection to the answer given when we question the possibility of seeing what the originators of the glyphs and their peers saw — and moreover, of relating to their practical experiences. A digital description, faithful to the dimensionality of each glyph and of each element associated to it, can report very precisely about the picture in general, as well as about its physical characteristics. Such a scan can be focused on infinitesimal details, or expanded into wide images, integrating landscape and reflecting changes (day-to-night, seasonal, etc.). Image processing techniques can help restore the 'original' through its digital duplicate. All these are here presented rather sketchily, but sufficiently to warrant the following suggestion: that we initiate an effort to accumulate all the images in a *unified format*, and make them available in a *standard display* technique — for all practical purposes CD-ROM of high definition images seems the most appropriate today — in order to use the most powerful abduction tools for defining their characteristics and disseminating this knowledge through networks connecting all those involved in the research. One can conceive an intermediary step: a series of laser discs and powerful programs for search and retrieval, with a component for annotation, that can be exchanged by scholars. Such a project was, in its broad sense, already carried out and resulted in a program called Docent™.[1] The program manages up to 54,000 still images, or a combination of video (maximum 60 minutes of video) and still images. Each still image can be viewed in detail, too. The user can write notes, execute searches by categories currently used, or by new categories. In the near future, the program will be extendable to include major semiotic identifiers, also

indexed. If this program is applied to a CD-ROM database of images, it can offer access over academic networks. Maybe major collections of images (slides, video, film, drawings) would be transferred to such storage and access media in preparation for the scanning effort suggested.

This effort should not preclude the parallel constitution of theoretical hypotheses, with the aim of testing them on the body of digitally stored material. The experience of seeing today affects our perception of the petroglyphs. The introduction of an element of unity (in capturing and storing images) ensures at least that we all refer to the same things, and that we can place them in the most appropriate contexts for interpretation.

A coherent context for interpretation

Powerful information processing techniques, together with computer modeling and simulation, constitute the underlying structure of the post-historic age. It is not the sheer attraction of technology that speaks in favor of their use; rather, it is the acknowledged need to integrate the research in the pragmatic framework of this time. I insist on the methodological aspect of the endeavor because I am firmly convinced that means and methods characteristic of the historic age (in particular of the literate approach) cannot do justice to the subject (nor to any subject). This idea requires some elaboration because it is in many ways restrictive.

Speculative semiotics extends the speculative discourse of other disciplines (primarily philosophy) into the realm of our concern for the means and methods of human expression, communication, and signification. When it ascertains the need for cross- and interdisciplinarity, it actually says that semiotic discourse can unify various interpretations by using its own specialized language as a unifying factor. As we know, after semiotics raised high hopes, it failed to deliver the knowledge everyone expected from it, while a new body of writing (some indeed brilliant) supplants structuralism, morphology, and other perspectives. A new interpretation of past interpretations, a new layer between the subject matter and those interested in understanding it results from semiotic applications. Alienated from its subject, semiotics seemed at times more interested with its own condition and its own vocabulary. For a while, I suspected that this happened because of the personal inability (lack of intellectual integrity included) of some semioticians, or even lack of competence. Today I see it quite differently — i.e., as a result of structural changes brought about by a pragmatic framework of rapid change, distributed knowledge, interconnection, and increased mediation. (These

are dealt with, in a different context, in Nadin 1992.) Semiotics in its new phase is the result of a new underlying structure of human activity. Parallel to language, many other sign systems became necessary and effected changes in the pragmatic framework. The semiotization of work, as well as the increased semiotic implications of education, leisure, and even existence — I refer to the far-reaching genetic component of human experience — results in the effective emergence of many languages. Command of these languages (of images, sounds, diagramming, and programming languages, etc.) defines para-literacies. The need to integrate them in the attempt to better understand phenomena that were only partially explained in the literate discourse cannot be overestimated. Many experts in petroglyphs and geoglyphs already make use of the powerful 'languages' of microscopic analysis, spectroscopy, statistical evaluation, and computer supported morphological analysis. It is time now to work on a *unified* perspective so that the variety of viewpoints and diversity of findings can be coherently integrated in improved explanatory models.

To provide a 3-D scan of petroglyphs might seem to some an exercise in technological virtuosity. But without the fullest possible inventory of the subject under discussion — the emergent forms of human expression, the beginning of *sign* activity — we would only continue to speculate on a reduced body of examples from a perspective so biased that no knowledge could be expected. We are in the happy situation of being able to relate various petroglyphs, to see how the environment, the context of existence, time, weather patterns, and many more affect human expression. For the benefit of the enterprise, we can consider this body as finite. Accordingly, our gnoseological expectations should not be severely affected by the exclusive relation between some illusory completeness (of explanations) and consistency (Nadin 1982). The 3-D quality I suggest will reintegrate each image in the three-dimensional world it belongs to, and thus return to us abductions based on facts. As much as we would like to limit ourselves to petroglyphs, we will soon discover that geoglyphs — what are perceived to be the etching of the landscape along lines of indexical significance — belong to the same family. Scale plays an important role. But let us not forget that what we perceive from the air as mysterious designs were actually carved for those walking along those lines, migrating for whatever reason, moving in directions of relevance to their existence. South America has quite a number of geoglyphs which, if the 'cave paintings' made it into recognition as art forms, qualify no less as expressions of aesthetic relevance, but of a scale that relates to the sublime (in Kant's definition).

The involvement of many groups, over longer time spans, make us

expect testimonies of societal forms, as well as of the ritualistic aspects of practical experience in the prehistoric age. Many findings of recent, and not so recent, time point to a very interesting reality. Initial expressions usually invite continuations. There is a definite cumulative aspect to the glyphs that cannot, and should not, be ignored. Whenever the expression is part of a notation, it is only logical that layers accumulate. After all, once the pragmatic condition is ascertained, we cannot exclude the fact that the life of glyphs continues in new practical experiences. In search of the 'original', the 'initial', the proto-sign, we would love to somehow unearth the first mark left. No matter how advanced our chemistry, how good our physics or refined our tools, there is a limit to the effort exactly because to measure always subjects the measured entity to an action from the outside. Scanning will not perform a miracle. But once the image is available in a digital format, knowledge about pigments, crystals, tools, even information about the anatomy of those who left their marks in the glyphs will allow us to formulate hypotheses that identify successive layers. In other words, we could write programs that will operate on the digital simili and visualize successive layers. I consider this possibility important in many respects. *First*: how notations change; how a system is followed; when the practical is taken over by the decorative, the aesthetic. *Second*: how technology (a better point makes finer microcups, an improved cutting edge allows for better control of notches, etc.) affects expression. *Third*: how the 'graffiti' (i.e., imitation and free additional expression) changes a given context. Nobody wants to discard marks left by early explorers (Morwood and Kaiser 1991: 94–98), some known to have 'signed' territories (such as in New South Wales, Australia, in Russia, and in China), but we would also like to see how coherent each layer is. For such purposes, the digital simili resulting from 3-D scanning will offer new maps of the very exciting, but frequently confusing, testimony embodied in the petroglyphs. A major effort would have to be made in the area of classification. Short of reinventing the wheel, we could probably benefit from the work on iconclass systems.[2] Initiated by the late H. van de Waal, the system applies mainly to art (in its traditional forms), but can be expanded to reflect the multidimensionality of the glyphs. As a machine-readable file system, it will support initial work until categories can be refined to meet specific expectations. The coherence we strive for corresponds to the coherence of the context of existence — quite different for those expressing themselves in petroglyphs or for others in geoglyphs. Once we accomplish the expectation of coherence, we can experiment with many of the cognitive mechanisms involved in the act of expression.

Setting cognitive goals

As important as it is to deal with the *How*? aspect — How did they represent? How did they do it? How was it used?, etc. — the *Why*? aspect, as this pertains to the cognitive condition of the human being, is definitely more pertinent to our gnoseological expectations. The *Why*? question is, nevertheless, like any question regarding intentionality, metaphysical. Surrounded by all kinds of mines ready to explode in our face, intentionality is, after all, where semiosis leads to. Generalities are met by easy (and quasi-unanimous) agreement. Our shared opinion that pragmatics is the key to the understanding of the glyphs is such a generality. It prepares us for the next task: the instantiation of pragmatics in concrete human experiences. Here is where consensus is a little more difficult to reach. Scholarly work — of anthropologists, archaeologists, art historians, historians at large, and many others — is evidence of heated debate. They are all about the *concrete* pragmatic context. No matter how precise the descriptions, how appropriate the measurements, how wide the perspective, in the final analysis there are marks of significance to the life and work of ancestors. In some instances, we have been able to decode, though never unequivocally, the image, read it as ledger, calendar, directional device, or element constitutive of a broader ritual (the rest of the signs, such as sounds, movements, fire, a certain position of the stars, etc. being 'reconstructed' to fit the explanation). In other instances, we have remained captive to syntax. Let us take, for the sake of discussion, the *art hypothesis*, probably the most frequently associated with the petroglyphs. It is very important to acknowledge that the *aesthetic appropriation* of the subject corresponds to an epistemological perspective according to which the aesthetic component is present in everything human beings do. Declaring petroglyphs works of art implies that an aesthetic intention can be attached to each of the artifacts. Needless to say, this is a strong assumption that I do not care to accept or discard. Since cultural, as well as perceptual, biases often affect our relation to the subject of concern, I find it more useful to allow those who build a body of specialized knowledge around some examples access to the visual database we will hopefully gather. When research was conducted on the pigments, a hypothesis was advanced that each historic group had its own hallmark paint recipe. This actually says that aesthetic experience became autonomous. Before discarding or confirming this viewpoint, we would need to see whether the aesthetic concern takes a leading role in a context of syncretism. Expanding the perspective can only benefit those who are already advanced in their research. Nevertheless, while the Sardinian inscriptions at the entrance of the Nuragic caves might well

qualify as art — and what, I may ask, does not, provided the right frame and the right signature, in this case, prehistoric man? — they are primarily maps, which encode practical information essential to the survival of those living in them or using them for practical purposes or rituals. So are the cave paintings and the Tam' riverbank petroglyphs, and the Indian inscriptions in the Valley of Fire. And even more so the non-iconic, highly decorative motifs discovered in India (e.g., engraved sections of antlers). So are the geoglyphs. Whether they mark water sources or water rights, whether they point to water rituals or to seismic lines, they display formal characteristics we tend to associate with beauty. Their cultural significance is by no means referential. The geometry reflects the same underlying structural relations that can be associated with aesthetic patterns in human action. Local topographical features are part of the vast design. Some think that the rather late Inca civilization reworked ancient Andean patterns. The thought deserves our attention because it is quite probable that each petroglyph is a condensed series of successive images, aesthetically relevant through some core elements that deserve to be determined. One of these elements is perspective. As already suggested, we could work on the digital simili in order to 'extract' layer after layer, examine each for coherence and formal appropriateness, in order to see how aesthetic progress actually took place. The acquisition of perspective, no less than the acquisition of notation systems or language, is a major milestone in the evolution of mankind.

The aesthetic code that we read into these images, regardless of scale and successive functions, results from cognitive characteristics of the human being. These reflect symmetry, rhythm, contrast, and other physical characteristics of the body, of the surroundings, and of the interaction among people and between people and environment. As underlying elements, they speak in favor of the human being as multidimensional: social animal (*Zoon politikon*), user of tools (*Homo faber*), *Homo aestheticus*, and finally *Zoon semiotikon*.

Semiotics and simulation

The epistemological premise of this study is concentrated on the program of glyph research in the context of the post-historic age. Three elements speak in favor of such a program:

(1) the vast body of factual knowledge regarding prehistoric testimony in all possible forms of expression;

(2) the post-historic revival of semiotics, reflecting the increased semiotization of human practical experiences; and

(3) the availability of means and methods, semiotically rooted, for establishing a highly interactive, distributed, networked digital library of images and interpretive contributions.

Once this program is formulated — and this was the major objective of this study — we are in the position to achieve many objectives. The most important seems to be the objective of defining the incipient *Zoon semiotikon* and understanding what factors were at work in the self-definition of the species through sign activities. I would like to suggest here an additional research program, which might sound more futuristic than it actually is. Fully benefiting from the digital simuli embodied in the database of all available images, we could build a model within which a major question could be addressed: what does it take to have a living system reach the stage of expression corresponding to the glyphs? Even the formulation of the program might confuse some traditional researchers. It sounds like questioning the beginning of the universe, or asking whether there is an ultimate elementary constitutive part to it. But these are indeed questions whose time has come. Modern physics deals with the very initial minutes of the universe; cognitive sciences are focused on mental capabilities; genetics, on reading the 'book' of human development, as it is 'written' in the DNA sequence. To miss the chance to articulate a similar program when we have most probable access to the very beginning of any semiotic process would be ironic — semiotic tools used by everyone but semioticians.

One script for the realization of the program speaks in favor of extracting from the database essential information: repetitive patterns, relational aspects, morphological descriptors. We could understand how conventions are submitted and eventually accepted. Another possibility is to take neural networks in a variety of configurations, incrementally input knowledge (probably what the first phase made available), and see at which level of complexity visual expression is generated. To enter into details here (what kind of networks, working in which type of knowledge representation, driving which kind of output device, etc.) would certainly be helpful, but beyond the scope of this paper. But the very thought that we could, at symbolic levels and at what some define as subsymbolic levels, examine circumstances leading to the synthesis of the visual is very attractive. We might, as I already (and enthusiastically) stated, gain a better understanding of the processes leading to the emergence of semiotic experiences, and in particular the emergence of language. Would the simulated environment afford the many layers of emotion and inquisitiveness characteristic of the 'real' thing? Probably not. Lascaux II will not give us the expression of the finger stroke, of hand movement, nor the temperature of the cave, the sensation of randomness of the dripping

water, the distance and depth. It does decontextualize the real cave, but social attribution of value, part of any semiosis, is powerful enough to make the replica a commercial success.

A virtual world must replicate not phenomenal, but essential reality. I cannot see how the emotion of finding out what it actually takes to make expression necessary within a living system can be equalled by any other satisfaction.

Partial goals, such as many already studied by anthropologists, archaeologists, morphologists, art historians, etc., are important but will not bring us to where we actually should be: the understanding of the cognitive processes leading to self-expression, social awareness, and communication. The chance we have is to indeed integrate specialized knowledge in order to reconstitute the cognitive process in its unity and variety (rationality and emotion included). Any other goal, as dignified and academic as it might sound, is no longer justified. In many ways, the holistic nature of the images we intend to examine requires a holistic approach on our side. That such a high expectation is difficult to achieve after the experience of deductionism that shaped our culture is at best a truism.

Notes

1. Docent is a trademark for a program, developed by Mihai Nadin, for search, retrieval, and authoring pertinent to massive storage of images.
2. Cf. Images: past and present. (Image classification and retrieval, iconographic research, iconoclass consultancy.) March 10, 1990.

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