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Intellectual and Spiritual Expression of Non-literate Societies

The stargazers: the evolution of knowledge, beliefs, and rock art

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1. Introduction

The knowledge and beliefs of non-literate societies have been the constant preoccupation of literate societies which tended to see in these "others" not only significant differences but also the symmetrical inverse of their own intellectual and religious values. In the nineteenth century abusive interpretations of Darwinism mapped these differences onto the successive scales of biological evolution conceived as a cumulative progress which reached its apex with *Homo sapiens* and, more particularly, its modern avatars, the western European males endowed with intellectual powers and moral righteousness. This view justified among other things the exploitation and even extermination of autochthonous populations whose backward evolutionary status was characterized by a lack of intelligence and an abundance of irrational beliefs. Jean-Jacques Rousseau's early idealization of primitive humans was drowned in the discourse which sustained the forceful civilizing process of colonization.

With the advent of ethnography, the way of life of non-literate societies was more empathically described and documented. Their religious beliefs and rituals were scrutinized, and some anthropologists and philosophers pointed out the cognitive consistency of their intellectual constructs (e.g., Lévi-Strauss 1966) and the ecological soundness of their usually sustainable exploitation of the environment. In attempting to assess the intellectual and spiritual expression of non-literate societies, we must be careful not to confuse cultural evolution and biological

evolution although the case has been made that culture can impact the course of biological evolution (Richerson and Boyd 2005). But it is only very recently that dramatic technological advances have unleashed transformative forces which might durably impact the biology of humans and their cognitive capacities.

The purpose of this paper is to draw attention to the cognitive commonalities which account for both literate and non-literate cultures, including prehistoric cultures, and to point out that these adaptive competencies carry some liabilities in addition to their adaptive advantages. Adaptations are indeed biological and cognitive traits of the phenotypes which are selected by the environment. Some of these adaptive traits can be carried over new environments in which they are less optimal since optimality is a relative quality not an absolute one. They can persist as long as they do not turn out to be lethal in the new environments. Some may even prove to be beneficial by exaptation. But they may also have unexpected, even perverse side effects. The case can indeed be made that the intellectual and spiritual defining features of *Homo sapiens* result from evolutionary flukes rather than straightforward adaptations by natural selection. These critical reflections will be applied to the emergence and role of stargazing in the human cultural construction of knowledge and beliefs.

2. The advent of the stargazers

The tree-dwelling common ancestors of primates was a rather small-size tetrapod which had adapted to tri-dimensional environments characterized by a limited horizon and populated by proximal vital resources such as branches, leaves, fruits, insects, mates, and predators (Beard 2004). Looking up beyond this niche concerned only the possible identification of birds of prey – a typical behavior which meerkats (*Suricata suricatta*) exemplify from the ground, often in a bipedal posture in order to increase their height (Macdonald 1999).

Early primates had evolved the capacity to distinguish colors which were relevant to nutrition and to mating. They also were adapted to the perceptual and motor management of space which allowed them to reach out toward relatively distal objects; jump from branches to branches; and aim projectiles at intruders. All these capabilities implied a sense of perspective, albeit a limited one since there was no survival value attached to processing spatial information beyond this organism's relevant horizon.

When, under physical and/or social constraints, these *hominids* evolved bipedalism and developed cultures adapted to their new environments, their upward posture necessitated adjustments to a form of visual space with respect to which their body plan and perceptual systems had not evolved. Their upright position allowed them to include the sky as a part of their phenomenological world and to process distal information although the acuity of their vision and their assessment of distance were far less optimal in this new context than other organisms which had adapted much earlier to long distance perception both visual and acoustic.

Brains are attuned to monitor the changes which occur in their environment within the thresholds of their perceptual capacity and to control adaptive behavior in response to information which is relevant to their survival and reproduction. From *Homo erectus* on, the sky was bound to become an important focus of attention as it was a portion of space in which both predictable and unpredictable, that is, maximally informative events kept occurring: fog, overcast, moving clouds, thunderstorm, lightning, apparent movements of the sun and the moon, eclipses, comets, meteors, aurora borealis, rotation of the constellations, and, naturally, rain and snow with, in addition, occasional meteorite showers. There can be little doubt that scrutinizing the sky became an increasing preoccupation of the early hominins which started moving beyond their ancestral niches across open space as it both provided orientation cues and resources. But how was this vital array of information interpreted by the brains of *Homo erectus,*

then its further evolved successors and, finally, the anatomically modern humans, *Homo sapiens* and *Homo sapiens sapiens*?

3. The theory of mind

Psychologists have identified an early stage in ontogenetic development when the child becomes able to represent to himself/herself the mental states of those with whom he/she interacts and to behave accordingly (e.g., Metzoff 2005). A mental state can be defined as a belief, an intention, or an emotion which will lead to action and whose result can be anticipated. The child is then able to intuit the points of view or attitudes of others which are different from his/her own. This competence was labelled "theory of mind" (T.O.M.) because the child develops the concept of what it means to have a mind, both for his/her own and for others, and therefore can figure out that the two may not coincide.

From the point of view of phylogeny, it is obviously an advantage to be able to anticipate the behavior of conspecifics as well as the likely strategies of prey and predators. Researchers in animal cognition have claimed that primates and even other mammals and some birds have evolved a nascent theory of mind which provided them with a vital adaptation to social life as it opened the way to manipulation and counter strategies (Premack and Woodruff 1978; Call and Tomasello 2008).

It is a reasonable assumption to consider that the common ancestor of apes and humans was endowed with such nascent evolutionary asset. We can further assume that the progressive increase in brain volume and neuronal connections which characterize the *Homo* species from *Homo habilis* to *Homo erectus* and to *Homo sapiens* correlated with the improved capacity of representing with greater precision the mental states of others and to adjust physical and social survival strategies to such hypothetical information. We must, of course, keep in mind that evolution will necessarily favor poker game modes of interactions

and will fuel an arm race both intra-specifically and inter-specifically.

Unpredictability of events is thus bound to be attributed to less decipherable minds in an environment in which recognizable behaviors enable the observers to anticipate the next expectable moves, or at least a limited range of possible actions. The scrutinizing of the sky offers many puzzling phenomena which can be attributed through analogical thinking to agencies endowed with states of mind and deliberate behavior. The objects of the diurnal and nocturnal sky, and the events which occur there and directly affect humans, are naturally interpreted through applying the theory of mind and thus construing an intentional rather than gravitational cosmos. Early Babylonian astrology produced cuneiforms which referred to the luminous gods which populated the sky. This bears witness to the social centrality of the priests whose function was to interpret the will and intention of these gods as they related to human affairs. It has often been pointed out that Babylonian astrology is not an absolute beginning but continued oral traditions whose origins are lost in the deep time of human cultural evolution. There is no real gap between non-literate and literate cultures as far as beliefs are concerned. The assumption of intentions to account for the movements and events occurring in the sky can be explained by the evolutionary selection and success of a species whose brains could represent other organisms' states of mind but placed no intrinsic limits on the range of entities to which such assumptions could apply. Evolution is a short-sighted tinkerer devoid of long-term vision.

An adaptive cognitive trait can thus lose its beneficial pay-off and lead to ill-adaptive behavior such as sacrificing resources to placate hypothetical agencies following the same logic which consists of a group providing predators with prepared preys in order to avoid being attacked themselves. Cosmic fear is indeed no less powerful than the fear of predators and competitors. Still in today's world countless humans experience this kind of fear and assign to invisible agencies telluric and celestial harms which

affect them. Random positive turns of events are sufficient to validate the efficiency of the rituals however ludicrous they may be.

The theory of mind carries a heavy cost when it is extrapolated to irrelevant delusional entities. This is why it can be reasonably claimed that spiritual expressions such as the worshipping of gods are the result of an evolutionary fluke which led humans to construe physical objects as intentional entities. But a fluke is a side effect of an adaptation which can turn out to be a handicap or an advantage depending on the contexts of its applications.

4. Analogical thinking

The capacity to abstract from a situation or an object some abstract features either morphological or functional was a crucial cognitive adaptation whose first evidence in the archaeological record comes from the prehistoric lithic industry. Survival depends on the proper identification of kinds of objects which vary in size, shape, and motion but implement the essential features of the template which has become wired-in in the brain during phylogeny and ontogeny. We, anatomically modern humans, spontaneously recognize human faces as soon as we open our eyes, and our brains are so attuned to this basic morphology that we often see faces where there is none as long as sufficient combinations of dots and lines prime our perceptual system. Not missing a face is a crucial adaptation for any *altricial* species, that is, a species whose offspring cannot survive without the care of the mother or other conspecifics.

However, the power of this algorithm is also a liability as it exposes us to falling victims to lures. Random natural patterns which happen to coincide even vaguely with the facial template or the template of other significant objects can trigger behavior which is irrelevant if not detrimental to an organism's survival. Such generalizations are the source of delusional knowledge and

behavior which is ill-adaptive. The nocturnal sky, in particular, provides a rich ground for misperception of this sort.

5. The patchy nocturnal sky

Visual perception is a tricky source of information. As many psychological experiments show, figure and ground are prone to flip and thus reveal different significant patterns. Another source of variability in perception is that what we know, or think we know, biases what we see. It is extremely difficult for us to replicate the empathic perception of the nocturnal sky by Pleistocene observers. We can only infer what they plausibly saw by trying to subtract from our experience what we have learned from centuries of scientific scrutiny of the sky with the help of ever improving telescopes; most of this knowledge is mediated by mathematical calculation and our inability to intuit the space-time of astronomical magnitude creates a gap between what we see and what we know. The latter is mostly counter-intuitive.

But let us attempt to imagine the way in which the starry sky of a clear night might have appeared to *Homo erectus*, Denisovans, Neanderthals, and anatomically modern humans. Let us also keep in mind that industrial pollution had not yet blurred the eyesight of these observers and that the atmosphere was crystal clear except, of course, at times when volcanic eruptions spread gases and ashes. For an organism which has inherited from its tree-dwelling ancestors a very limited sense of distance and perspective the celestial ceiling must have seemed quite close, somewhat like a monumental cave ceiling.

Observation of the nocturnal sky reveals that some of the dots maintain constant relations with each other while others present different kinds of relations and movements. Stable clusters can prime the perception of familiar animals whose contours fit the space delimited by these luminous points. Both the Chinese and the Indian zodiacs whose origins are lost in the deep time of oral cultures express each one of these configurations through stylized

zoomorphic or anthropomorphic images. Stylizations like the ones produced by the use of cuneiforms in Mesopotamia are not likely to be the most ancient ones.

But there is more. The bright dots of the celestial dome are not evenly distributed. There are dark patches which appear foregrounded once they are noticed. Black holes and cosmic dust clouds abound. Flipping the ground-figure relationship reveals striking patterns which are evocative of the shapes of various animals. Once lexical labels have been affixed to such patterns it becomes impossible not to perceive them as the relevant figures. The classical psychological experiment which consists of projecting on a screen a set of black dots on a white background bears witness to this. At first, subjects report seeing random patches. But as soon as the word dog is uttered everyone sees a Dalmatian dog frolicking in the snow. Once this perceptual switch has been activated this image will never appear to be a mere set of random patches.

Modern astronomers have identified numerous dark patches which they call *nebulae*, the Latin word for clouds. Some of these are silhouetted against areas which are saturated by stars and are noticeable from the earth without the help of telescopes. One of the most famous examples is the *Horsehead nebula* in the constellation Orion. What has been labelled the *Pipe Nebula* is a long dark nebula visible within the dense star cluster Ophiuchus. Instead of identifying this dark patch through its morphological analogy with a contemporary artifact, it would be equally easy to "see" an animal form with legs and a tail. The native populations of the Atacama Desert in Northern Chile could see dark patches which resembled lamas and they assumed the existence of a spiritual link between the presence in the sky of a heavenly embodiment and a species which was essential to their survival. Lama silhouettes are abundantly represented in the rock art of this region and we can raise the question of whether they are meant to refer to the live lamas found in their environment or to the dark patch found in the sky.

Atlases of the universe offer many examples of dark blotches endowed with suggestive forms which can be easily related to earthly animals, plants, or landscape. See, for instance, http://www.atlasoftheuniverse.com/darknebs.html and http://astronomy.swin.edu.au/cosmos/D/Dark+Nebula

The perception of dark biomorphic patterns in the nocturnal sky might have preceded the geometrical constructions consisting of joining cluster of salient dots by straight lines and finding analogs of these schemata in the forms found in the natural environment. The latter is what gave rise to the zodiac and to the naming of the constellations. Such visual and intellectual elaborations presuppose cognitive competences which might have their source in the identification of blotches evoking familiar silhouettes in the mind of the hominins who had become stargazers as a side effect of bipedalism.

Only the systematic scanning of the nocturnal sky in conditions plausibly similar to some periods of time in the Pleistocene could yield interesting hypotheses, notably regarding rock art. This should include calibrating the patches thus identified since cognitive biases precisely cause the natural calibrating of visual information toward known forms. Naturally, this scanning should not involve technological means which were not available to prehistoric populations.

6. Conclusion: stargazing and the meaning of rock art

The main hard evidence of the intellectual and spiritual expressions of non-literate populations is found in rock art. But this abundance of data in itself is far from being fully understood. Even in the case of contemporary productions of figurative and abstract paintings and engravings, their meaning remain elusive as they are often expressions of secret knowledge and sacred rituals. This is, of course, all the more true of prehistoric data as very little is known about the social and religious contexts in which these graphic representations made sense some thirty or forty thousand

years ago. Moreover, the Pleistocene archaeological record cannot be reliably interpreted through ethnographic analogies.

Many hypotheses have been proposed to explain the presence of rock art in its numerous forms all over the planet earth. Each one of these hypotheses concerns only a subset of the data available and attempts to find the function which might explain it, thus excluding from its purview numerous other signs. But if the visual sets of figures are approached from a comprehensive point of view which acknowledges the full range of signs both iconic and geometrical, and the complexity of their combinations, we may find there an analog of the starry sky and a representation of the powerful agencies which rule its movements and events. This hypothesis displaces the referents of rock art from the immediate environment which is populated by animals to the dark presence of their "divine" prototypes which can be perceived in the nocturnal sky but which could only be rendered in the guise of their terrestrial forms on the walls of caves and cliffs. The distinction between the spiritual and the intellectual is a recent dichotomy which is also manifested in the equally recent distinction between astrology and astronomy. Looking at rock art as the earliest attempts to map the sky and record its predictable and unpredictable behavior, possibly in order to anticipate events or even control them, may sound like a far-fetched hypothesis but one which would be consistent with the first evidence of literate cultures in Mesopotamia and in China where the creation of writing as we understand it today was rooted in astrological preoccupations carried over by oral and graphic traditions originating in deep prehistoric time.

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