Articolo commentato / *Discussion article*

Roots of the Savage Mind.
Apophenia and Imagination as Cognitive Process

di MATTEO MESCHIARI

commenti di

FRANCESCO BENOZZO, PETER BRUGGER,
NICLAS BURENHULT, ALESSANDRO MANCUSO

con una replica dell'autore

Roots of the Savage Mind.
Apophenia and Imagination as Cognitive Process

by MATTEO MESCHIARI

The dynamic of pursuit and escape is the great sculptor of brains
Paul Shepard [1998b: 6]

Abstract

Questo articolo discute e sviluppa la *Landscape Mind Theory* (LMT) che l'autore ha precedentemente formulato. Utilizzando un'ampia scelta di esempi etnografici e le recenti acquisizioni delle neuroscienze, viene esplorato il ruolo del paesaggio e dell'ecosistema nel modellare le strutture cognitive di *Homo sapiens sapiens*. L'analisi si concentra in particolare sulle culture di caccia e raccolta, e mostra come la fenomenologia venatoria da un lato e le attività intellettuali e simboliche rivolte all'ambiente dall'altro siano legate tra loro da fattori evoluzionistici e culturali. Un rilievo particolare viene dato alle produzioni immaginative e linguistiche dei cacciatori-raccoglitori.

[**Parole chiave**: cacciatori-raccoglitori - processi cognitivi - apofenia - caccia - Landscape Mind Theory (LMT)]

This article discusses and develops the *Landscape Mind Theory* (LMT) that the author previously formulated. Using numerous ethnographic examples and recent research in neuroscience, he explores the role of landscape and the ecosystem in the shaping of cognitive processes in *Homo sapiens sapiens*. The analysis focuses in particular on hunter-gatherer cultures, and shows how hunting phenomenology on the one hand and intellectual and symbolic activity related to the environment on the other are connected through evolutionary and cultural factors. A particular emphasis is placed on the imaginative and linguistic productions of hunter-gatherers.

[**Keywords**: hunter-gatherers - cognitive processes - apophenia - hunting - Landscape Mind Theory (LMT)]

The *Landscape Mind Theory* (LMT) that I outlined a year ago in this journal (Meschiari [2008a]), has been the object of reflection and commentary by certain readers. The main ambiguity raised about the theory is the following: is the "landscape mind" a new metaphor to talk about cognitive processes and how they are organized, or should it be taken literally, meaning that there *really* exists an isomorphism between mental structures and landscape structures? In other words, if the landscape and functional interactions with it have modeled the cognitive pool of *Homo sapiens sapiens*, to what extent – between genes and culture – is the human brain a reflection of the ecosystem in which it was

formed? The most obvious and immediate objection is: how can we explain the universality of certain landscape-based cognitive traits (cognitive mapping, wayfinding, folkecology, sacred ecology, ritual landscape) through the evolutionary response to pressures of a paleoenvironment, when in fact *Homo* colonized very diverse ecological niches? Are these not, rather, different adaptive responses? And the logical corollary is obligatory: either it is a matter of local cultural adaptation, whose similarity is polygenetic, or these faculties are innate, but they are grouped at a more general cognitive level, in the sense that they *also* serve to experience and understand the landscape.

The pages that follow propose a most radical theory: the human brain was modeled on the landscape by natural selection (and by "landscape" I mean the space of physical, cognitive and social interactions between humans and the ecosystem), while the problem of paleoenvironment is incorrectly formulated. We know with certainty that the ecological context intended as habitat and as dynamic relationship between the species is capable of selectively operating on genes, but more than wondering about the ancestral landscape in which *Homo* evolved, we should wonder what *Homo* had to know how to do in order to survive in it. If, for example, the food supply of the Nunamiut of Alaska is based 87% on hunting, 3% on gathering and 10% on fishing, while that of the Penan of Borneo is based 30% on hunting and 70% on gathering, we easily deduce that the difference is due to opposite environmental conditions (Kelly [1995: 67-69]). However, we tend to neglect a fundamental factor, which is that the system of hunting and gathering is not one subsistence strategy among many, but it is the *only* way of life that has characterized *Homo* for at least two million years (Lee - De Vore [1968]; Bettinger [1991]; Lee - Daly [1999]; Panter - Brick *et al.* [2001]; Waal [2001]). Analyzing in particular hunting phenomenology and its cognitive relevance (what does a hunter need to know to succeed?), I would like to emphasize the fact that, beyond the necessary familiarity with plant and animal species and with the physical structure of the land, hunting (and in a similar way gathering) is based on universal innate strategies *independent* of the specific ecological context.

In addition to relying on the obvious support of ethnographic data, I would like to strengthen my argument with examples from neuroscience, cognitive psychology, and evolutionary psychology (Mithen [1996, 1998, 2006]; Golledge [1999]; Lewis-Williams [2002]; Dehaene *et al.* [2005, 2006]; Renfrew [2007]). These approaches are not unrelated, and it is actually their confluence that offers the scholar a new heuristic model. After a long period of epistemological crisis, perhaps the time has come to solidly construct a new anthropological method based on synchronic and diachronic comparison (in the field of ethnolinguistics, see for example Benozzo [2007] and Costa [1992, 2003, 2008]). Comparative ethnology, or the use of recent ethnographic examples to resolve the problems raised by paleoethnology, has been the source of heated debate for more than a century. But if we work under the assumption of a genetic-cognitive unity in *Homo sapiens sapiens* (Stone - Lurquin [2007]; DeSalle - Tattersall [2008]), it is possible to identify in the evolutionary genetics of the brain, in

neuroscience and in cognitive psychology a level of consistency coherent enough to proceed to a "total" comparison. It will not be a matter of comparing de-contextualized cultural facts, but rather ecosystems, subsistence, foraging and cognitive strategies that regulate the comprehension of the former and the development of the latter.

To investigate the roots of the "savage mind", I would like to concentrate on a particular aspect. The study of the "categorical impulse" (Ellen [2006]), from Claude Lévi-Strauss [1962] to Scott Atran and Douglas Medin [2008], (i.e. *folk-taxonomies* as representation of the world), usually neglects a fundamental dynamic principle: imagination. I am not referring, at least for the moment, to the cultural imagination of man as "myth creator" but, at a more elementary level, *biological* imagination that plays a role in the causal comprehension of the physical world. The "stem cell" of this imaginative faculty, which we probably share with other mammals, can be identified in a neurocognitive phenomenon called *apophenia.* In the coming pages I will argue that apophenia is at the center of a bundle of cognitive faculties closely connected to understanding landscape, potentiality for enhanced success in the hunt and the production of symbolic thought through linguistic images. The hypothesis is that behind the savage mind, in a way that has yet to be studied in depth, there exists a "generator of images" that has played a crucial role in the evolution of the human brain: at the center of fundamental semiotic questions, born of the landscape and for the landscape, it can enlighten us on the "present prehistory" of our way of thinking.

Imagining

Apophenia is derived from the German *Apophänie*, a term coined by the neurologist Klaus Conrad [1958] to define the exaggerated tendency of schizophrenics to see imaginary connections of meaning. More recently the term has been used to define "the pervasive tendency of human beings to see order in random configurations" (Brugger [2001: 196]) or "the experience of seeing meaningful patterns or connections in random data" (Petchkovsky [2008: 247]), therefore a modality of the mind that is not necessarily pathological, and is even universally characteristic of the human species (Fyfe *et al.* [2008]). Apophenia may be visual (recognizing familiar images in ambiguous configurations such as inkblots, clouds, patterns in wood and bark, rock outcroppings, constellations, etc.) or auditory (recognizing voices, words and phrases in casual or involuntary sonic emissions that have no human meaning). The phenomenon, which has been observed since Antiquity (Pliny), has had applications both artistic (Leonardo da Vinci, Cozens, Escher) and psychoanalytical (the Rorschach test, the Sandplay Therapy), but in general it has been relegated to the domain of mere curiosity. However, greater importance has been given to one of its specific variants, *pareidolia*, or the tendency to recognize noted figures in casual configurations (Christ's face in a stain on the wall, the profile of the Virgin Mary

in a rock, etc.). In a strictly scientific field, the current tendency is to ascribe an important cultural role to apophenia and pareidolia, as shown by studies in the domains of neurology (Brugger [2001]), psychology (Petchkovsky [2007]) and anthropology (Guthrie [1993]; Lahelma [in press]). Certain ethnographic examples of apophenia can help us to illustrate the phenomenon's spatial and temporal range as well as its centrality in the respective cultural systems.

a) *Mbuti decorative motifs*: Among the Mbuti Pygmies of the Ituri Forest in the Congo Basin, the women use "abstract motifs" to decorate barkcloth (*lengbe*), which are obtained by beating inner bark from ficus trees. These ritual decorations are inspired by a principle of mobility: dots, dashes, lines, interlaces, chevrons, waves, spirals, base motifs, complex motifs and the relationship between full and empty space, all respond to unexpected rules of accumulation, progressive complexity, variability, asymmetry and synchopy, until an imbalance and rupture in the composition is sometimes achieved. What emerges is a strong propensity for dynamism, which has a parallel in the ecological and social mobility of the Mbuti group, and in the polyphonic yodelling that accompanies the significant moments of their life. The reversibility of the design (positive/negative, full/empty) and the confusion of visual relationships (figure/background, periphery/center, high/low, inside/outside) are all factors that render ambiguous the perceptive and conceptual dualism, transferring even into the decorative system the dynamic-ecological principle of spatial mobility of the hunter-gatherers (Turnbull [1965]; Farris Thompson [1983]; Farris Thompson - Bahuchet [1991]; Meurant - Farris Thompson [1996]). Some scholars have emphasized the resemblance between these graphic results and plant vines, woven baskets, hut structure, string figures, the coat of certain animals, the starry sky, etc. Mbuti women, when asked about the meaning of their designs and these similarities, gave vague or ambiguous answers, such as "it *looks like* this" or "it *could be* this", demonstrating that the apophenia triggered by their designs (similar to that of Multistable Vision Patterns) maintains dynamism and guarantees polysemic openness, avoiding unequivocal and definitive identifications (Meschiari [2008c]).

b) *String figures*: This is the most widespread example of apophenia documented in ethnography (Africa, the Americas, Australia, Borneo, China, Korea, Europe, the Philippines, Japan, India, New Guinea, New Zealand, Siberia, Oceania). These figures are formed by a string tied at both ends to form a ring, which is then woven through the fingers and the thumb to produce abstract geometric figures. The more or less pronounced resemblance between these images and real objects led to their "recognition" and their naming based on the native context, and many figures are related to local plants and animals. The same figure may be found in various cultures, but its interpretation differs considerably. From an ethnological standpoint, the relevant aspect is that the "game" is usually connected to the history and the mythology of the group and is practiced in narrative and pedagogical contexts, of which they are the visual accompani-

ment (Furness Jayne [1962]; Averkieva - Sherman [1992]). Whether these configurations are obtained by accident or whether they are invented *ad hoc*, their fruition creates the conditions necessary for the manifestation of the phenomenon of apophenia: the ambiguity and abstractness of the images demand of the observer an effort of anagnorisis that necessarily relies on images from the physical world.

c) *Paleolithic art*: European rock art tended to intentionally integrate the contours of the pictographs and petroglyphs in the anomalies of the rock substrate. In other words, a veining, a limestone dripping, a convex or concave portion, a nodule or a chromatic variation in the rock could allude to anatomical parts of an animal, such as a spine, a belly, hooves, an eye, or even the ground on which it is standing. In this way, the animal was first "glimpsed" in the rock, and only later was it drawn by retouching, emphasizing and completing the outlines (Graziosi [1960]; Lejeune [1981]; Leroi - Gourhan [1982]; Lorblanchet [1993, 1995, 1999]; Meschiari [1999]). To explain this "visionary" behavior, some have suggested altered states of consciousness due to sensory deprivation induced by the environment of deep caves or the possible use of psychotropic substances (Lewis-Williams - Dowson [1988]; Clottes - Lewis-Williams [1998]), but apophenia is more than sufficient to justify the phenomenon. In support of its universality, it is worth citing *The Prelude* by William Wordsworth, not so much as a literary curiosity, but rather for the extraordinary exactitude in the description of apophenic dynamics:

> The curious traveler, who, from open day, / Hath passed with torches into some huge cave, / The Grotto of Antiparos, or the Den / In old time haunted by that Danish Witch, / Yordas; he looks around and sees the vault / Widening in all sides; sees, or thinks he sees, / Erelong, the massy roof above his head, / That instantly unsettles and recedes, – / Substance and shadow, light and darkness, all / Commingled, making up a canopy / Of shapes and forms and tendencies to shape / That shift and vanish, change and interchange […]. / But let him pause awhile, and look again, / And a new quickening shall succeed, at first / Beginning timidly, then creeping fast, / Till the whole cave, so late a senseless mass, / Busies the eye with images and forms / Boldly assembled, – here is shadowed forth / From the projections, wrinkles, cavities, / A variegated landscape, – there the shape / Of some gigantic warrior clad in mail, / The ghostly semblance of a hooded monk, / Veiled nun, or pilgrim resting on his staff: / Strange congregation! yet not slow to meet / Eyes that perceive through minds that can inspire [1850: VIII, vv. 563-592].

In order to understand the cognitive and cultural reach of apophenia, we must explore the physiology of the brain. A first step is to examine non-pathological subjects characterized by a strong propensity for belief in magic and the paranormal and for hallucination (traits that are particularly pronounced in schizophrenic patients). It has been observed that, on the one hand, these individuals show a reduced dominance of the left hemisphere of language, and on the other they register greater activity of the right hemisphere, characterized by a tendency to grasp distant semantic connections (Leonhard - Brugger [1998]; Pizzagalli *et al.* [2001]; Brugger *et al.* [2007]). The right frontal lobe seems to contribute to the generation of dynamic images evoked by ambiguous visual in-

put (Minor *et al.* [1989]; Gill - O'Boyle [2003]), and if we intertwine the two observations we can hypothesize that magical thought on the one hand and apophenia on the other participate in the general cognitive module of "belief" described by Wolpert [2006]. Moreover, it appears that the neurotransmitter dopamine is directly involved in the process, if it is true that one increment of it provokes a decline in the condition of a schizophrenic patient, while in healthy subjects it produces an increase in curiosity and meaning-making, at times linked to rapturous, numinous states and frequent apohenic experiences (Mohr *et al.* [2004]; Petchkovsky [2008]).

From an evolutionary standpoint, apophenia may have played an essential role in the predation and escape mechanism: mimicry and recognition of danger in ambiguous perceptive contexts are amply documented in biology. In a wooded habitat, for example, recognizing without delay prey or predator in the indistinct foliage constitutes a selective advantage, even in the case of error: it is better to be mistaken in a hurried evaluation than fatally delay, waiting for certitude. And the example of foliage helps to clarify the cognitive mechanism: in a system of dark and light spots, the eye, stimulated by confused forms devoid of autonomous meaning, analogically completes outlines and ambiguous masses, based on the model of known images (Haken [1979]; Kelso [1995]; Kruse - Stadler [1995]; Falk - Konold [1997]). While for western contemporary man it has been reduced to a mere curiosity, it is plausible that apophenia functioned for millions of years as an essential survival mechanism. But it is the intermediate stage that we are interested in, that is, the moment, and especially the way, in which the biological fact took on a cultural surplus. Although it is relatively intuitive to link phenomena such as animism and religion to Wolpert's "belief-generating machine" [2006], and Guthrie [1993] places pareidolia at the center of his theory on religion, we must concentrate the analysis on the semiotic relevance of apophenia.

Cutting out discontinuities in the perceptive continuum of the world is the inevitable condition of every act of comprehension (Buttitta [1996]), and apophenia seems to operate in exactly this way, preferring perceptive short-cuts to the stalemate generated by an ambiguity. In an ecological context in which rapid decision-making can mean the difference between life and death, and in an environment in which establishing even illusory random connections is preferable to the cacophony of a world made up only of punctual events, biological imagination serves the function of an elementary cognitive "glue". Sign and meaning are treated as a single thing, and it is precisely their necessary relationship (only in appearance) that lends itself to the interpretation of phenomena in a way that favors survival. If the track of an animal were not its "metonymy", it could not be interpreted as a "presence in absence", and it could never "lead" the hunter to the prey. Inversely, since every image has an unexpected semantic surplus (Wunenburger [1997]), the track *is* the animal, but it is *also* itself, or, if incomplete and difficult to read, it can be decidedly *something else*. In other words, apophenia may resolve an ambiguity but it never does so definitively, and it can even trigger a perceptive oscillation that, after the first at-

tribution of meaning, always slips into new projections, as in Multistable Vision Patterns (Leopold - Logothetis [1999]; Leopold *et al.* [2002]). If, therefore, the first solution is sufficient for an animal, the perspective shifts radically for modern humans, who are "schizophrenically" programmed for the search for meaning. This is why a handprint on the wall of a cave has an imperfect mirror image effect and it is precisely for this reason that it is meaningful (that hand is me, but it is not really me. What is it then?). As I said, the crucial point is to understand how apophenia became symbolic thought. And that is where hunting comes in.

Hunting

There is a book on this subject that made history: *Man The Hunter. The First Intensive Survey of a Single, Crucial Stage of Human Development – Man's Once Universal Hunting Way of Life*. For those who question the adjectives "crucial" and "universal", the editors Richard Lee and Irven de Vore, settle the matter in this way:

> Of the estimated 150 billion men who have ever lived on earth, over 60 per cent have lived as hunters and gatherers; about 35 per cent have lived by agriculture and the remaining few per cent have lived in industrial societies. […] It is still an open question whether man will be able to survive the exceedingly complex and unstable ecological conditions he has created for himself. If he fails in this task, interplanetary archeologists of the future will classify our planet as one in which a very long and stable period of small-scale hunting and gathering was followed by an apparently instantaneous efflorescence of technology and society leading rapidly to extinction. "Stratigraphically", the origin of agriculture and thermonuclear destruction will appear as essentially simultaneous [Lee - De Vore 1968: 3].

Of equal importance are books by Robert L. Kelly [2007] and George C. Frison [2004], but the ecological approach of the former and the archaeological approach of the latter leave little space for cognitive considerations. Their hunting phenomenology informs us on very detailed biological and technological strategies, but it does not tell us what happens in the brain of the hunter. It is, in effect, a rather impregnable subject, and it is difficult to find authors who are comfortable discussing it. What follows, however, are a few enlightened examples. The first is about the "joy" of hunting:

> Rather than anxiety, it would seem the hunters have a confidence born of affluence, of a condition in which all the people's wants (such as they are) are easily satisfied. This confidence does not desert them during hardship. It can carry them laughing through periods that would try even a Jesuit's soul […] [Sahlins 1968: 89].

> […] one might expect to find a more happy-go-lucky attitude among groups which have achieved a homeostatic relationship with regard to food resources. Such a group might move from one resource area to another, consuming immediately available products; or a group might gain time utility from resources through storage and preservation techniques and stabilize population below the point at which exploitation of the standing crop would threaten productivity. The point here is that "happiness" in the sense of

little care for tomorrow would be more a function of homeostasis than of hunting *per se* [Binford 1968: 90].

Here we notice the oscillation and can imagine the spectrum of the hypotheses: from the subjective and idealized invention of the hunter-gatherer – seen as a "beautiful soul" or Rousseau's noble savage – to that which brings the discussion back to a more impersonal ecosystemic matrix. Paul Shepard has a different approach, highlighting the fact that hunting, more than a simple subsistence strategy, is a pervasive and totalizing experience, it is a way of life. Commenting, for example, on Ortega y Gasset's text *Sobre la caza* [1943], he observes:

> There is a sense in which metaphors on hunting to explain mental activity are not metaphors at all, and we must take care not to suppose that the true reality is the metaphor. […] To hunt for an idea can never be fully understood – or fully practiced – by those who have not hunted game. Ortega, like many students of the traditions of hunting, is careful to note that many philosophers and other great men have been hunters [Shepard 1998a: 149, 150].

It should come as no surprise that a primatologist like Shepard would refer to the work of a philosopher: just as apophenia and its perceptive phenomenology are more well documented in literature (besides Shakespeare and Wordsworth, we could cite the apophenias in Dino Campana's *Orphic Songs,* Vladimir Nabokov's *Signs and Symbols* or William Gibson's *Pattern Recognition*), the psychological-cognitive aspects of hunting – which are rarely the subject of scientific analysis – are well represented in narrative and non-fiction creative writing (the works of Mikhail Prishvin, Eugenio Barisoni, Ernest Hemingway, Ted Kersote, Barry Lopez, Bob Benson and James Kilgo come to mind). But what Shepard says – that in evolutionary terms, hunting has shaped the human brain – remains well within the realm of science. The following are a few ideas – almost aphorisms – on hunting and cognition from *The Tender Carnivore and the Scared Game*:

> To urban man the range of the hunter's daily experience may seem small and boring, but his boredom is not a true reflection of the measure of sensory richness and diversity of possible experience in the hunter's camp and habitat [Shepard 1998a: 132].
> The hunter, unlike the farmer, cannot move on to some other place. His mental health and orientation are inseparable from the particular features of his terrain. This is the real "territorial imperative" [Shepard 1998a: 140].
>
> [Among boys in ancient hunting-gathering societies], play hunting has the same relationship to hunting that love for mother has to adult love: grounding in a fundamental context combining action and implicit thought. […] Every animal brought to camp for butchering is a lesson – in language, anatomy, perception – and an exercise in thinking [Shepard 1998a: 140].
>
> The variety of spiritual attention given by different tribes to all the steps of hunting in its many forms is immense. In all cases, however, men are engaged in more than a merely physical food-getting activity, for in hunting they are immersed in their most deeply held spiritual and aesthetic conceptions [Shepard 1998a: 143].
>
> For cynegetic man nature is a language. I do not mean only that he is a skillful reader of animal behavior or meteorological events but that nature functions as a syntax. Travel

across the terrain, the internal anatomy and relationship of animal parts, the taxonomy and classification of plants and animals with its concept of species, the *objet trouvé* – all are steps in the normal maturing of consciousness and mentality [Shepard 1998a: 145-146].

The choice of passages is not only illustrative: I would like to discuss individually the underlying ideas of each (sensory richness, territorial imperative, apprenticeship, spiritual attention, landscape as cognitive syntax), relating them directly to apophenia and other faculties of mental imagery.

a) *Sensory richness and reading landscape*: ethnographic literature has always referred to the "exceptional" naturalistic skills of hunter-gatherers, from the many shades of white recognized in snow by the Eskimos to the Aboriginal Australians' sense of direction. The first effort to depart from a merely impressionistic evocation of these refined natural capacities was *The Savage Mind* by Claude Lévi-Strauss [1962], which even prior to the studies in cognitive psychology and neurophysiology on the subject, opened the door to the modern folkbiology. As I have pointed out (Meschiari [2008a]), it would be more appropriate to talk about "folkecology", linking it to other indispensable naturalistic competencies such as folkgeology, folkanatomy, wayfinding and cognitive mapping, etc. In any case, it is worth noting that modern studies on intuitive taxonomies developed by human societies neglect or minimize the imaginative components of these ways of understanding the world. The idea that the classificatory instinct is linked to a general module of the brain, interpreted as the result of direct selective pressure, now seems to have been confirmed by interdisciplinary studies in cognitive psychology and anthropology (Fodor [1983]; Atran [1990]; Berlin [1992]; Hirschfield - Gelman [1994]; Sperber [1996]; Atran - Medin [1999]; Ellen [2006a, 2006b]. But some scholars' use of categories such as *taxa* to interpret ethnographic data runs the risk of imposing a western model on the information gathered.

According to these studies, the competencies of the interviewed groups reflect a few basic taxonomic principles: 1) biological knowledge is hierarchically organized into inclusive groups, the *taxa* (animal → mammal → feline → leopard); 2) at each hierarchical level the *taxa* are mutually exclusive (fish vs. mammals vs. birds vs. reptiles); 3) every known living creature is automatically attributed to a *taxon*; 4) although the *taxa* are culturally variable, in general the hierarchical levels are stable across cultures (folk-kingdom, life-form, folk-generic, folk-specific, etc.); 5) the entire system functions in an inductive-inferential manner (i.e. if two species have a common characteristic, it can be inferred that such a characteristic is also shared by other species in the same *taxon*; if a new animal is put into a *taxon*, there is a tendency to automatically attribute it with the same characteristics shared by other animals in that *taxon*); 6) living beings are characterized by a "causal nature" or "essence" (Atran [1998]) that determines its appearance, behavior, habits and organic identity (a sort of internal "intelligent design", or "proto-animism").

In reality, the system is much less mechanical, and the exceptions are so numerous as to call into question the very validity of the basic principles. I am not referring to the potential taxonomic ambiguities – such as in the case of the

Iglulingmiut of Baffin Island, who indiscriminately include spiders, insects, worms and crustaceans in the taxon *qupiqruit* ("small animals") (Randa [1996: 98]) – but rather to the fact that the *taxa* can almost always partially overlap, both horizontally and vertically, and that there exist classificatory systems superimposed on these that lead to a transgression of hierarchy, levels and inferential rules. Among the Inuits, for example, the hierarchical principle matters less than relationships of contrast and inclusion; in other words, the animals are not perceived as isolated entities within the *taxon*, but as crossroads of complex relationships, even with animals belonging to different *taxa* (for example the wolf and the killer whale, or – based on much less obvious connections – the lemming, which is the center of the constellation "walrus – ermine – harfang – squirrel"). This interweaving of naturalistic knowledge spreads to other levels, and conditions mythology, ritual practice and language (in Nunavik, for example, the connection between the muskrat, *kiggaluk*, and the falcon, *kiggavik*, is made explicit even linguistically). Vladimir Randa speaks of the necessity of studying "the relationship that imagination maintains with the observable" [1996: 97], and affirms that although the connections between animals are "real", meaning based on the ecosystem (predator-prey relationship, shared habitat, related food chain, etc.) or on physical appearance (similar coloring, morphology, etc.),

> the analogical, associative character of the Inuit zoological thought is manifest. It consists of systematically recognizing in an animal characteristics that are likely to correspond to those of other animals. In other words, animals are thought of in relation to one another, the fauna thus forming a system. When the same animals are associated with several registers, the same traits that are emphasized through observation tend to be reused in the construction of different types of representations. Therefore, imagination is fed, in part, by experience [Randa 1996: 113].

The reference to imagination is essential, on the condition that the functional vector is inverted: it is not so much imagination that feeds on experience, as experience that is organized by imagination, meaning that it acts as a causal glue (meaning-making) capable of transcending mere taxonomic logic. Moreover, the fact that the animal is never decontextualized from the environment in which it lives, but functions as a metonymy of the place that it occupies in physical space (geographical habitat) and in ecosystemic space (biological habitat), suggests that taxonomic organization is embedded in a primordial topological matrix. And in that case, it would be more appropriate to talk about *topoi* rather than *taxa*, to account for the various levels – even spatial – of the interweaving. The issue could be made that while the construction of a hierarchical taxonomy is the reflection of an innate behavior, transgressions of the norm are the result of a cultural drift. It is very probable, but we should not exclude the possibility of a biological explanation, linked to the tracking and stalking capabilities of hunters.

To return to the sensory and experiential wealth of hunters, it is almost certainly due to an exhaustive knowledge of the hunted ecosystem, the habits of the species, and the specificity of the land, but even Lévi-Strauss [1962] pointed

out the excess of information that characterizes these naturalistic competencies. In fact, it has been observed that folk-taxonomies respond not only to the primary need to catalogue edible or poisonous species, but that they extend to living forms for which humans have no immediate use. The example of the zoological classification of the Inuit demonstrates a similar redundancy enhanced by the imagination, and the biological reasons can be found at a superior level: thinking about species in terms of an "animal landscape" or "animals in the landscape" – that is, adopting a systemic and holistic vision of living creatures – is the reflection of a cognitive tendency that impels humans to interpret *the whole*. This tendency toward hyper-interpreting natural signs, as well as the importance of imagination for the hunter, is described by Richard Nelson in this explanation of moose tracking:

> A hunter wants to find signs that the moose is feeding and resting in a certain area, as indicated by a very crooked, wandering trail with beds in the snow, broken willows, and perhaps areas where the snow has been pawed to get at the vegetation underneath. The more tracks he finds the better. On the other hand, a straight trail through the forest is a bad sign, because it probably means that the animal was on the move and is now far away. […] Instead of following directly in the animal's track, the Indian makes semicircular detours or loops downwind away from the trail, returning to it at intervals. If he circles back and does not find the trail where it should be he knows the moose has doubled back. At this point he makes a series of smaller semicircles back in the direction from which he came until he finds the animal's doubling-back trail, which he then follows [Nelson 1983: 104-105].

Reading animal as well as environmental signs requires not only competencies stored in the memory, but also faculties of analogical projection, prediction, mental imagery and imagination. In this hypersemiotic perspective, therefore, folk-taxonomies are only the tip of the iceberg in a much more complex and uncertain system of experiential and sensory competencies: the successful hunter is the one who best interprets the landscape, gathering a greater number of circumstantial facts and forcing them to produce a unitary and predetermined meaning. It is not simply a matter of knowing how to read tracks and following them, but rather of interpreting the entire landscape as a track, establishing causal connections between phenomena that are perhaps unrelated but which in the end become *the* dynamic-evenemential track of the absent prey. Imagining an animal that is not visible, including its movements and its potential behavior, even in the absence of real tracks, means setting its behavior in the real milieu that is offered to a sensitive hunter: detail assumes a central importance, the connection between details is invented, and the dynamic whole of the details is an invisible tale. The "basic cell" of apophenia is therefore articulated through a complex apophenic chain, which perhaps represents the second evolutionary stage of the human imaginative faculty.

b) *Territorial imperative and unknown landscapes*: Knowledge of the land is an essential prerequisite for a hunter. More than geomorphological and biological competence, it is a matter of being able to distinguish minor but significant particularities for orientation and stalking:

[The Kutchin] seem to focus upon minute details of the scene that confronts them rather than viewing the landscape more generally, as an Outsider does. This ability to pick out subtleties in the environment probably comes from practice; at least it seems that Outsiders are able to improve their perceptiveness greatly over a period of time. I found that the Eskimos in north Alaska, for example, would point out "hills" in what looked like perfectly flat tundra. After months of hunting and traveling with them, however, I could see these "hills" quite easily [Nelson 1983: 90-91].

But this is almost a paradox: if familiarity with the environment is fundamental, how can one hunt in unknown territory? The problem must have arisen more during the first human migrations than for more recent hunter-gatherers: while the latter tend to exploit in rotation or alternation relatively close territories that are traditionally well-known, the former must have found themselves in totally unknown environments. For these explorers, the individual experience of one life or the collective experience passed down for generations proved to be partially useless (Kelly [2003]). If we combine with this factor the low numerical density of human groups in the Upper Paleolithic and the hostile environmental conditions in Europe and America during the Ice Age, imagining a colonization by simple expansion is somewhat reductive: the risks of failure were too high. Studies of Neolithic diffusion have shown, however, that the first groups of colonists tended to choose places that were morphologically and ecologically similar to those of origin, as if a desire for familiar territory influenced their decision (Fiedel - Anthony [2003]). But even that does not explain how humans could act in unfamiliar places, seen for the first time; we must attempt to understand the cognitive strategies that were put into action to transform the disadvantage of an unknown terrain, whose ecological system and particularities were alien, into an immediately usable resource (Rockman - Steele [2003]). One plausible hypothesis is that *Homo sapiens sapiens*, and perhaps even his predecessors, superimposed known environmental models on unknown places in order to feel "at home" even in a foreign land, and in order to move in unfamiliar terrain with a greater sense of security. This could have also come from a fundamental faculty of language: naming, describing and outlining the new domesticated it (Sanga [1997a, 1997b]). In more general terms, it would have been like projecting a mental map of their own territory onto a new country, stochastically adjusting as they explored (Golledge [2003]). The need to imagine, think and talk about an unknown place through the lens of a known one that resembles it has been sporadically documented in ethnography, as in the case of the Wola of Papua New Guinea:

The mention of a place's name can conjure up its attendant physical geography. It can serve to represent a landscape type and substitutes for a technical description. Reference to the place called Paym in a topographical context for example, will suggest a relatively level valley pocket and all that this implies physically, whereas citing the locale of Pongtenda will suggest karts terrain, and so on. When they relate events and tell stories, the Wola frequently depict the terrain featuring in the narrative by referring to somewhere like it known to all those listening, sometimes suffixing the place name with the word *nonbiy* or "like" [Sillitoe 1996: 112].

But this behavior, culturally supported by language and toponymy, has much deeper neurophysiological roots, if it is true that even today we experience *déjà vu* in places that we have never been before, or that we perceive as vaguely familiar a place that we are seeing for the very first time (Benozzo [2004]; Meschiari [2008b]). The following account by Robert Kelly takes us right to the heart of apophenic phenomena:

> […] at the 1990 International Conference on Hunting and Gathering Societies (CHAGS) in Alaska I was listening to a paper on northern Scandinavia. The slide that was projected had been taken from a boat facing the shoreline, and it showed a wide expanse of water with a very low terrestrial horizon that I perceived as "flat". Two Inuit from northern Canada entered the session after the speaker had been introduced and, after looking at the slide a few moments, asked me if the paper was about a particular place on the north Canadian coast. When I replied no, one commented to the other that the hill in the photo looked just like a particular place near the MacKenzie Delta. I had to look again at the slide to see, indeed, a slight rise in the middle of the photo that to me was meaningless as a topographic marker [Kelly 2003: 49].

Like Richard Nelson, Robert Kelly is amazed by the perceptive faculties of the Inuit, but what is interesting for our purposes is that the Scandinavian coast was mistaken by the Inuit for the Canadian coast: this is a clear example of landscape apophenia, by which an unknown territory is interpreted as a familiar territory based on a random morphological resemblance. This example contains a whole range of inductive possibilities that illustrates the advantage, in evolutionary terms, of "seeing" familiar places in places that in reality are not familiar at all: 1) similar habitats are treated as the same habitat (efficient strategy from an ecological point of view); 2) geomorphological similitude activates wayfinding and stalking abilities used in analogous places (efficient strategy from a topographical point of view); 3) similar sites are likely to reproduce previously observed phenomena (a probable, possible or unlikely event, such as the sudden appearance of an animal near a stream – probable; in a clearing – possible; at the site that resembles the one where an animal was killed – unlikely). The basic idea is the same as the one already described for more elementary biological imagination: better to act in doubt than to not act at all.

c) *Apprenticeship and magical landscape*: For a hunter-gatherer, knowing the landscape is a life-long process, but it is during childhood that the cognitive strategies on which he (or she) will depend later in life are activated (Hewlett - Lamb [2005]). Before learning to hunt, the child familiarizes himself with the hunting terrain, and in particular: 1) develops topographical awareness of the territory, distinguishing confines, areas of transition, thresholds, barriers, etc., and using landmarks to organize his perception of space; 2) memorizes itineraries, distances, how long it takes to get from one place to another and strategies of spatial navigation and local orientation; 3) assimilates biogeographical competencies on the distribution and the associated dynamics of plant and animal species; 4) learns to recognize ecosytemic connections between the catalogue of familiar places, plant, animal and geological taxonomies, weather and

climatic typologies, etc.; 5) connects the stories and mythological tales of the group to specific places; 6) fills himself with generally unconscious strategies that help him interpret an unknown landscape through the individual exploratory experience and the cultural heritage of the group, for example hunting stories, or the language itself, which can be "landscape oriented", meaning that it is partially organized on a geographical structure (see below). But, once again, to these abilities must be added the glue of imagination, which creates cross connections that are more or less real, more or less advantageous, between different sorts of phenomena. The Wola of the plateaus of Papua New Guinea, for example, demonstrate outstanding competence in the area of folkgeology, which is the foundation of a cultural landscape in which topography and imagination are based on one another:

> […] while disinterested in the origins of rocks and lacking to my knowledge any theory or myth-equivalent about how they came to be or how they relate one to another, the Wola are fully aware of the different kinds of rocks that outcrop across the surface of their region, and their properties. […] Regardless of their variety, the Wola make few terminological distinctions between limestones. The exceptions relate to the state of the rock, not its type. They distinguish rotten powdery limestone, found in dump locations (for instance, limestone buried in wet soil) or where pieces of fractured limestone have ground pulverulently together (for instance along a fault line), calling it *haen hok*. […] The soft and friable calcareous mudstones and siltstones are also *haen hok*. […] The Wola perceive a connection between the rocks that predominate in any area, notably whether sedimentary or volcanic, and its landscape [… and] appreciate in some measure that the different geologies, although imperfectly understood, exert some control over the landforms that they can see. […] While the Wola may not exploit the rocks of their region to any great extent, its geology has impressed itself in other ways on their culture. They associate some of the countless potholes that occur throughout the limestone for example, with spirit forces, particularly those containing a deep pool of water [Sillitoe 1996: 127, 129, 120-121].

At the basis of hunter-gatherers' landscape-oriented behaviors – even those characterized by a very structured cultural envelope – there exist innate cognitive modules: wayfinding, cognitive mapping, categorical impulse. While the last of these seems to be unique to our species, we share the first two with other primates (Bicca-Marques - Garber [2004]; Strier [2007]). In general, these modules allow us to *internalize in complex spatial representations* a wide range of ecological information, and therefore can be described as truly imaginative activity. But the imagination comes in through other ways as well, ways that seem to be in logical contrast, or in weak relation, to the body of "realistic" knowledge acquired in the landscape:

> All humans dream, of course, and many dreams are experienced as an escape from the boundaries of everyday life. But for hunters, the dream experience is real. The events of the dream are relied upon as a guide to trails and the location of animals. In this way, dreaming is also an actual hunt or a phase of gathering. For many hunter-gatherers dreams are a form of decision making. Along with other forms of insight and intuition, hunters use dreams to help them decide where to hunt, when to go there, and what to hunt. These decisions can be matters of life and death; they certainly make the difference, day to day, between an adequate and an inadequate supply of essential food. […]

To make these decisions, hunters need knowledge. They must bear in mind all the facts that inform the choice. […] But a listing of facts is not enough. […] In the end, there is a need for some other kind of knowledge, some leap of the imagination, some way of processing the facts so that they yield a conclusion [Brody 2000: 247, 248].

Nocturnal dreams (REM sleep), shamanic dreams (altered states of consciousness, visions) and waking dreams (*rêverie*, day dream, hypnosis, hallucination) are all cut from the same cognitive fabric; but to understand the evolutionary relevance of the imagination, it is useful to refer to the mental development of a child, who even before experiencing cultural imprinting, begins to create imaginary causal connections between perceived phenomena. If in fact, on the one hand, the child seems to possess a sort of innate intuitive physics that helps him to grasp the connections between mass, position and movements of solids, on the other it is well known that children tend to develop a magical conception of the world in which the causal connections are invented (Corrigan - Denton [1996]; Harris [2000]; Schlottmann [2001]). The cognitive usefulness of this "false" knowledge can be understood based on Jean Piaget's concept of "realism", that is, "the confusion of thought and things, or of me and the outside world" [2005: 128]:

from the moment that realism consists of considering as belonging to things and as emanating from things that which, in fact, is the result of activity itself, it goes without saying that activity itself is conceived, in turn, as plunging immediately into things and as being all-powerful over them [Piaget 2005: 131].

While avoiding the trap that compels us to homologate ontogeny and phylogeny, it can be agreed upon that the imagination satisfies a fundamental psychological need of *active* control over reality, which, above all, is the most immediate and direct response to the cognitive urgency to make out *meaningful* and *positive* connections between things. This need of meaning, fed by magical thought, finds its clearest adaptive reason precisely in the context of hunting: a "believing" hunter – who mentally evokes the animal in order to push it into a trap, who speaks to it in order to calm it and convince it not to flee, who thinks about it intensely in order to make it appear exactly where he expects it, who trusts "supernatural" signs – is actually more optimistic and persistent than the "skeptical" hunter. And in this sense apophenia plays a consistent role: if the tracks are indistinct, I must use my imagination to complete them and deduce the direction of the animal – perhaps I will be wrong, but if I do not do it I will never know; if a rustling in the underbrush sounds like an animal passing by, I will freeze and stay silent – maybe I am wrong, but if I continue walking and make noise, I may spook a potential kill; if the shadows of dusk inhibit my vision and I think I see a familiar shape, I prepare to shoot – I could be wrong, but if I do not draw the bow and the animal is really there, I will have lost the advantage. The hunter suffers from a referential obsession (Piaget's "logical and ontological egocentrism") which compels him to interpret the natural realm in which he is immersed in a centripetal and predetermined way. It is an obsession that can also drift toward internal confabulation, the perception of "external

voices" that guide the action, and trance and hallucination. It is therefore not unthinkable that schizophrenia is not simply a cerebral error, but the extreme vestige of an adaptive tendency that was advantageous for hunter-gatherers, an idea that seems to be partially confirmed by ethnographic literature linking shamanism and mental illness (Silverman [1967]; Noll [1983]; Lex [1984]; Winkelman [2000]; Krippner - Combs [2002]; Polimeni - Reiss [2002]; El-Mallakh [2006]).

The generator of belief which Wolpert [2006] discusses, and which the author justifies in many ways, could be the evolutionary result of more than two million years of hunting and gathering. In hunting phenomenology – beyond the necessary ecological competence – all of the qualities that constitute belief come into play, without exception: 1) *certitude* of one's own knowledge and judgment; 2) *willingness*, when faced with a dilemma, to accept solutions that are immediate and "evident" rather than rational and statistically proven; 3) *representativeness,* according to which something new is judged based on its correspondence with what is already known, and on the presupposition that that which is similar is connected; 4) *anchorage* in personal and traditional knowledge that function as postulates from which to draw conclusions; 5) *self-deception*, as constructions of perceptions, ideas and cultural structures that are imaginary but endowed with a certain practical efficacy. This is a summary in the words of a Cree hunter:

> In the past, animals talked to people. In a sense, there is still communication between animals and hunters. You can predict where the black bear is likely to den. Even though the black bear zigzags before retreating into his den to hibernate, tries to shake you off his trail, you can still predict where he is likely to go to. When he approaches his den entrance, he makes tracks backwards, loses his tracks in the bush, and makes a long detour before coming into the den. The hunter tries to think what the bear is thinking. The hunter and the bear have parallel knowledge, and they share that knowledge. So in a sense they communicate [Berkes 1999: 80].

The reading of the ecological semiosphere is interpreted by the hunter as a semi-intentional communication between different species. This imagined projection, as I will illustrate in the next section, is the main connective tissue between ecosystem and cosmology, and is the element that explains the animism of hunter-gatherers, not in speculative or psychological terms, but in evolutionary and adaptive terms.

d) *Spiritual attention and sacred ecology*: The Cree of James Bay, Canada believe that it is animals, not humans, that control the success of the hunt. The animals observe the humans and know their every activity, and this compels the hunter to fulfill certain obligations to them, in a relational system that extends the principle of reciprocity to the non-human world. Passive partner in this reciprocity, humans must tempt the animal into being captured, and the best way of doing this is to show it respect: the more widespread and prompt the respect shown, the more likely the animal is to concede. This produces gestures of spiritual attention that permeate the hunter's entire sphere of action:

The Cree say that the main reason for showing respect to animals is that humans and animals are related, they share the same Creator. Just as one respects other persons, one respects animals. Cree culture is rich with rituals related to respect. Among the Chisasibi Cree, respect for the animal is shown in several ways: the hunter maintains an attitude of humility when going hunting; the animal is approached and killed with respect; the animal is carried respectfully to camp; offerings are made to the animal; the meat is butchered according to rules signifying respect; the meat is consumed according to rules signifying respect; the remains of the animal are disposed of properly [Berkes 1999: 83-84].

From this point of view, the world is considered a community of beings in which cosmological and ecological systems tend to coincide, but it is clear that the "Creator" functions as a normative closure of a highly regulated daily practice. The analytical itinerary, however, goes from the biological to the cultural: humility and respect in the quest for and the killing of the animal are psychological projections of more elementary strategies of caution and silence in the activity of predation; the respectful transport of the animal to the camp is another means of maintaining a vigilant attitude in order to avoid frightening a potential prey on the return path; butchering and consuming the meat according to strict rules does not have only social repercussions (showing respect toward certain members of the group, reinforcing community bonds, satisfying the reciprocity of the gift), but, as with the disposal of the remains, it satisfies the primary demand of reducing to a minimum the traces of the butchering, the meals, and the waste, so as to avoid attracting possible predators and to leave the place as it was prior to the hunt. Even the offering made to the animal is the symbolic reinforcement of a biological preoccupation: reciprocity serves the purpose of rectifying the offense of the killing and alleviating the hunter of what he experiences as a psychological responsibility, but more than that, it represents the basic ritual gesture that renews the awareness of something that is much more than a utilitarian *quid pro quo* of the ecosystem. Tim Ingold makes this observation about circumpolar cultures:

The world of this 'animic' understanding is home to innumerable beings whose presence is manifested in this form or that, each engaged in the project of forging a life in the way peculiar to its kind. But in order to live, every such being must constantly draw upon the vitality of others. A complex network of reciprocal interdependence, based on the give and take of substance, care and vital force – the latter often envisioned as one of several kinds of spirit or soul – extends throughout the cosmos, linking human, animal, and all other forms of life [Ingold 2000: 113].

It could be said, then, that the intuition of an ecological homeostasis and the necessity of sustainable conduct translate into a system of rules and beliefs, the so-called "sacred ecology" (Cox [1973]; Descola [1994]; Berkes [1999]; Krech [1999]; Nazarea [1999]; Surrallés - García Hierro [2005]; Menzies [2006]; Haen - Wilk [2006]; Harkin - Lewis [2007]), in which magical imagination plays a connective role in the passage from the biological to the cultural. If, in effect, we analyze the way in which the hunter thinks about landscape, somewhere between innate prerogative and traditionally acquired cultural structures, we can understand the original connection between apophenia, magical

thought and symbolic thought, and their fundamental ecological role. The holistic representation of the cosmos concerns not only the realm of living beings, but also the inanimate world, or better yet, it extends to the inanimate world certain qualities of living beings, in a animistic conception of geomorphology. This is observed especially in landscape creation myths, and not only in those universally known of the Australian Aboriginals (Munn [1984]; Layton 1995]; Morphy [1991, 1995]; Fullagar - Head [1999]; Layton [1999]; Smith [1999]). It is the case, for example, among the Plateau Indians of British Columbia:

To Indians, those geological transformations were the work of Coyote, culture hero and slayer of fire-snorting monsters. He carved the rivers Snake and Columbia, which served Indians as gateways to buffalo-rich grasslands (eastward) and the trade-promising seacoast (to the west). Along their river valleys, he created shoals, narrows and marshes, with natural pools and spills that rose steplike into higher elevations. […] The true events of mythic times made this land and peopled it with these spirits. Plateau Indian stories told of the rock near present-day town of Nelson, in southeastern British Columbia, which contained the imprints of Grandfather, who helped Coyote perform his earth-transforming deeds; the boulder that another superhuman being made from a young mountain lion's heart; the thermal spa where Four Brothers boiled meat in a "pot" between the Kootenai and Columbia rivers, thereby creating the streams that flow in opposite directions and wrap their streaming "veins" around the world, which sometimes bubbled up into hot springs for the benefits of human health and pleasure [Nabokov 2006: 150, 153].

And among the Koyukon of Alaska:

The scope of Distant Time stories ranges from the minute to the cosmological. […] Features of the earth, such as prominent hills or mountains, are also given some accounting in these stories. For example, a hill near Huslia is called "Giant's Firemakers" (*Yiłkuh tł aala*), because it was formed when a giant man lost his flints there. […] Near the upper reaches of the Nulitna (*Nolaaytna*) River, for example, there is an area covered with sand dunes. Scattered among the dunes are many depressions (perhaps twenty-five feet deep), said to be permanent despite constant shifting of the sands. These were made by two giant men who fought the possession of the dunes, making huge footprints in the sand as they wrestled. […] The landscape is also filled with other associations, many of them supernatural powers that lurk near certain places or emanated from them [Nelson 1983: 16-17, 34].

It has been observed that among the Wola of New Guinea, there are no recorded myths about the origins of land forms, but there is no lack of connections between geology and the supernatural:

At a place in the Was valley called Simborolbombok, there are some caves high above the river where local inhabitants say the spirits of the deceased reside, those who suffer violent deaths going to the left and others to the right hand caves. Some geological formations add to the awesomeness of the mountainous Wola homeland. The foregoing spirit caves for instance are adjacent to a massive rock arch across the river which is used as a bridge, the crossing of which involves a thrilling climb up notched logs until you are perched tens of meters above the thundering river below, when you scramble using root handholds up a steep slope high onto the opposite bank. Other geological features associated with limestone include rock pinnacle and cliffs weathered to weird shapes, standing up like enormous jagged teeth [Sillitoe 1996: 121].

In this case, more than ethnographic information, we notice the point of view of the ethnographer, who is struck by "weird shapes" and who unwittingly reproduces the associative process that he attributes to the Wola. In other words, whether you come from England or Papua New Guinea, from the twentieth century or the Upper Paleolithic, geomorphological curiosities universally trigger an apophenic mechanism and stimulate an etiological explanation. This explanation may be mythical, narrative or folkloric, or it may be based in an intuitive science. But it may also have repercussions in the scientific field, such as in the case of *Archaeology of Natural Places*, when the researcher attempts to identify possible cult sites in a natural landscape while observing landmarks. As in the case of the Saami of Norway:

> The sacrificial sites are generally known as *siejddes*. They are nearly all places that seem to be distinguished from the surrounding landscape by their striking topography. […] The *siejddes* are often characterised by rock formations that bear a certain resemblance to humans, animals or birds. These features were retained in their original forms and the shapes of these outcrops were never changed. […] They might be particularly massive or they could be an unusual colour. Some of the most distinctive were blocks that had been split open during cold weather to provide fissures or natural portals leading into the surface of the rock [Bradley 2000: 6].

These notable morphologies, which we could call "geophanies", illustrate perfectly the cultural role that apophenia can play in the construction of a sacred geology, and though the phenomenon transcends the universe of hunter-gatherers, it nevertheless occupies an important position in the process that leads the hunter to weave an imaginary cultural web over the hunting ground (Boivin - Owoc [2003]; Lahelma [in press]). Marek Zvelebil, proposing a comparative study of the ethnographic culture of the Ket of Podkamennaya Tunguzka, the Namforsen culture of Sweden (5500-1500 B.C.) and the mesolithic culture of Olenii Osrtov in Karelia (5500 B.C.), created a model of the ritual landscape of sub-Artic hunter-gatherers from the Paleolithic to the present. His synthesis is relevant:

> […] practical landscapes are also ritual landscapes. Practical activities are embedded in a broader framework of ideology and ritual; profane time is linked to ritual time. Cosmology and ritual impose a web of meaning on the landscape, and in its turn, landscape enculturated through symbolism and ritual plays a role in the processes of social production and reproduction. There is now an extensive ethnographic record of hunter-gatherers using feature of a landscape as a means of communications, as claims to ownership, as structures of meaning and as structures of power. Such social strategies are usually legitimised through ritual and by reference to cosmology and mythology, where ancestors play a major role. Ritual landscapes then, possess symbolic, ancestral and temporal significance, which is complementary to, and dialectically interactive with, the practical, economic landscapes [Zvelebil 1996: 36].

We must add that, if the interpretive framework is correct, sacred ecology, geomorphological animism and sacred geography are coherent cultural responses to the demands of the hunter-gatherer: helping him experience and think about the hunting grounds with confidence and self-control, they accompany him at all times and through all actions with information and strategies that are highly ef-

fective in both the short and long term. But Zvelebil's model neglects the evolutionary dimension: are these culturally acquired cognitive structures, or can we trace a genetic path in the ecological and cosmological behavior of hunter-gatherers? In other words, are there elements that allow us to affirm that the problems landscape has posed for *Homo* in terms of survival and adaptation have contributed to sculpting his brain in function of culturally processed behaviors?

e) *Cognitive mapping* and *Cognitive landscaping*: Until now I have discussed mainly apophenic episodes, or at the most, apophenic chains. Discussing sacred geology is another thing. We are accustomed to believing that complex cultural structures are the result of social invention, but it is not absurd to attempt to trace the innate matrix of certain highly structured landscape-based behaviors. In fact, if we closely analyze the universal mechanisms of wayfinding and cognitive mapping, we can argue that it is precisely upon these neurocognitive structures that the construction of cultural landscape is based. In particular, landscape, as it is both perceived and experienced, is organized on: 1) *landmarks*, or notable points in the environment that aid in the absolute and relative localization between humans and place and between place and place; 2) *paths*, or itineraries of interconnection between sites, places, areas, etc.; 3) *homing* (path integration), or the faculty of reversing the order of data gathered along a traveled path in order to return to the point of departure, integrating topographic references and travel times; 4) *piloting*, or the faculty of reaching a destination that is not directly perceived by constructing a sequence of previously noted places and landmarks; 5) *chunking*, or dividing the itinerary into easily memorized pieces; 6) *schemata*, or generic cognitive strategies that because they are useful in memorizing recurring spatial structures and objects in their context, serve to compensate for a potential lack of perceptive information; 7) *cognitive mapping*, or the internal representation of the external world through codification and memorization of spatial information (Golledge [1993, 2003]).

The effectiveness and frequency of use of these skills vary considerably from individual to individual and from culture to culture, but anyone is capable of developing them through experience and the right training (see for example the case reported by Nelson [1983: 90-91] on the perception of landmarks). Their universality leads us to believe that they are the genetic response to a given context that is primarily environmental, and secondly, social. In particular, the noticeable differences in strategies of orientation that exist between modern day men and women are interpreted by evolutionary psychologists as an adaptation to different relationships with space that the division of roles brought about during archaic times: a hunter had to develop macro-territorial skills while a woman dedicated to gathering tended to refine detailed knowledge on a reduced scale (Tooby - Cosmides [1992]; Lowton *et al.* [1996]). The neurocognitve faculties in points 1-5 are shared by other primates and mammals, which seems to be proven by the capacity for wayfinding in certain monkeys (Bicca-Marques - Garber [2004]), while for the purposes of this discussion, point 7 merits further examination.

Cognitive mapping is a controversial topic because there currently exists no proof that the brain organizes acquired spatial skills into anything similar to a map. The expression "cognitive map" tends to be considered, rather, as a useful metaphor to designate the cerebral activity that processes spatial information stored in the memory (Golledge [2003: 30]). Nevertheless, certain recent studies have localized two distinct and complementary areas in the brain that play a role in the recognition of places, and that are therefore directly involved in wayfinding and cognitive mapping. These two areas are the Parahippocampal Place Area (PPA) and the Retrospenial Cortex (RSC), the former linked to the perception and codification of spatial structure of places both familiar and unknown, the latter to topographic memory and long term spatial knowledge, in particular of familiar places (Epstein *et al.* [1999, 2007]). We should add that the PPA tends to react better to images of closed spaces, while the RSC reacts positively to images of open, expansive spaces (Henderson *et al.* [2007, 2008]). Finally, these areas are equally activated in the presence of visual stimuli as when the subject is asked to mentally visualize a place, which means that visual perception of places and their imagined representation (mental imagery) are products of the same cerebral areas (O'Craven - Kanwisher [2000]). These data provide the starting point to interpret cognitive mapping less metaphorically than we were able to until very recently. It is fairly plausible that while the PPA is the cerebral area most qualified to perceive, process and recognize static data like landmarks, paths and fixed topographic structures, the RSC seems qualified to preside over a series of mnemonic type operations, such as homing, piloting, chunking and schemata. In this sense, cognitive mapping could be described as the operative and dynamic process that integrates representation of places (PPA) and topographic memory (RSC), in an internalized model in which the temporal and spatial relationships between the parts are based on what has been defined as a "geometric model" (Cheng [1986]). Therefore, something less than a mind organized like a map, but something more than a simple spatial metaphor.

In any case, it is worth noting that based on this complex cognitive system, the most complex and culturally diversified landscape behaviors of *Homo sapiens sapiens* can be explained. In effect, it is not as important that cognitive mapping is a way in which the brain is "really" internally organized, as it is that the brain developed a specific topographic-topologic module to deal with environmental problems. Moreover, if ethnographic and palethnologic literature reports numerous cases of wayfinding and cognitive mapping in which the landscape is known with topographic awareness and competence (see for example Spink - Moodie [1972]; Conkey [1984]; Jones - Eliza [1986]; Brody [1988]; Francis - Kelley [2005]), just as numerous are the examples in which the importance accorded to the landscape extends beyond the ecosystemic-cosmological sphere. My hypothesis is that environmental pressure provided *Homo* with a specialized cognitive structure to solve problems linked to spatial comprehension of the ecosystem, that is, the principle problems in the two million years of human history. But in *Homo sapiens sapiens*, for a sort of functional co-optation (exaptation), this "landscape module", at the time the module of complexity *par ex-*

cellence, was reused to confront other complex realities, and in general to organize (in a landscape-based way) knowledge. For this reason I am compelled to talk about "cognitive landscaping", a universal faculty documented by numerous ethnographic and archaeological examples in which real topography becomes a matrix of topological thought that applies to other spheres of reality. As Shepard says, "nature functions as a syntax" [1998a: 145]:

> The entire Koyukon system of geographic orientation is based on rivers, not on the compass points used by Westerners. […] Direction and distance on land are reckoned by a complex of terms meaning upriver, downriver, toward the river, away from the river, and across the river. […] Other features are also described by reference to the large rivers – for example, a lake has a shore toward the river, a shore away from the river, and upriver and downriver shores. This is only a basic summary of a complex and sophisticated system for geographic location and mental mapping. The system combines locational terms, including the elemental ones above, with hundreds of specific place names known by Koyukon adults and elders. Besides these reference points, people develop their own mental maps of regional topography during their lifetime [Nelson 1983: 36].

The hydrographic structure of the Koyukon territory is thus a grid that spatially organizes their geographic, ecological and spiritual knowledge. But there are cases in which different semantic horizons tend to overlap, as in the case of the body and the landscape:

> The early apprehension of anatomical form and function served to configure ancient man's perception of the world. Anatomical form remains a salient organizing system even in cultural categorizations that have little or no apparent connection with anatomy. […] The organization of the mammalian body provides a basis for intellectual organization, and anatomical analogies and reasoning are found in all cultures. […] The Aleuts and the Eskimos are able to state position very precisely. This is done by means of demonstratives and postpositions, so that position, relative position, relative level, invisible position (invisible to the speaker), dawn on the water, upward on the land and toward the interior, and enclosure or house position (the one farthest back or nearest the entrance, etc.) can be deftly depicted. This habitual concern with position is expressed in internal anatomy as easily as in external geography [Laughlin 2004: 150, 172, 156].

The confusion of levels is meaningful: anatomy is a model for thinking about other organized realities, like landscape, but in turn landscape is a model for thinking about anatomy (in addition to the Australian examples previously cited, see also Bastien [1985] and Alinei [2008: 259]). Places of the body and the body of places are, in effect, the matrix of universally diffused mythological thought, but are also the first and most immediate form of analogical thought, a protostructure that sets the mind on the path towards complexity. We should, for example, reread the important observations of Dorothy Lee on non-lineal thought, from a fully landscape point of view. Studying the language of the Trobriand islanders, Lee noticed the absence of lineal thought in the spatial, temporal, causal, dynamic and narrative. The non-lineal codification of reality is manifested in a language that is at once disparate and centripetal, in which the word "refers to a self-contained concept", with no adjectives, predicates, prepositions or conjunctions. It is no coincidence that the most exhaustive examples provided by Lee regard the perception of space and cognitive mapping:

A Trobriander does not speak of roads either as connecting two points, or as *running from* point *to* point. His paths are self-contained, named as independent units; they are not *to* and *from*, they are *at*. And he himself is *at*; he has no equivalent for our *to* or *from*. There is, for instance, the myth of Tudava, who goes – in our view – from village to village and from island to island planting and offering yams. […] Point after point is enumerated, but his sailing from and to is given as a discrete event [Lee 1950: 94].

Malinowski diagrams the garden site as a square piece of land subdivided into squares; the Trobrianders refer to it in the same terms as those which they use in referring to a village – a bulky object or an aggregate of bumps. When the plots in the garden site are apportioned to the gardeners, the named plots are assigned by name, the others by location along each named side of the garden. After this, the inner plots, the "belly" of the garden, are apportioned [Lee 1950: 94].

In a spell naming villages on the main island, there is a long list of villages that lie along the coast northward, then westward around the island, then south. To us, of course, this is lineal order. But we have no indication that the Trobrianders see other than geographical location, point after point, as they move over a physically continuous area; the line as a guide to procedure is not necessarily implied. No terms are used here which might be taken as an implication of continuity; no "along the coast" or "around" or "northward" [Lee 1950: 94].

The negative definition ("non-lineal") and the ethnographic description, which tends to emphasize the *absence* of something, give the false impression of a cognitive void, as if the Trobrianders reason "in pieces" and perceive their world as an aggregate of monads suspended in nothingness. If, on the other hand, we recognize that languages are never completely arbitrary, but can be "landscape-oriented", as in the case of the Inuit or Apache, then Lee's "non-lineal" could be substituted by this same term. In other words, the Trobrianders have worked out an ideological and linguistic representation of their environment that, influenced by insular geography and by the spatially circumscribed activity of horticulture, leads them to interpret the landscape (and all of reality, for that matter) as a centripetal space, closed in on itself. In this closed space, the continuum was not made discreet by known points and connecting lines (which are more effective on a continental scale or in the context of hunting), but was seen as a mass of spots (the vegetable plots?), in which there was a natural and spontaneous relationship of juxtaposition between the spots, the parts, the objects and the action. In the third part of this essay I will discuss the linguistic aspects of the founding of a cultural landscape, but here it is sufficient to observe that topography and ways of using the land can permeate the most varied aspects of a culture.

The last series of examples, taken from archaeology, are rich and complex, and therefore merit a separate discussion (Meschiari [2004]). We have already encountered the case of *Archaeology of Natural Places* (Bradley [2000]), where noticeable topographic reliefs were endowed with an extra symbolic meaning that made them excellent landmarks. These natural shrines were not modified by humans, but the mere fact of frequenting them and connecting them with other noted sites by walking from one to the other, contributed to the creation of a sacred geography, carved out of the land and full of concrete implications for the daily life of the individual (Tilley [1994, 2004]). At times, however, the need

for more explicit intervention was felt, and the land was *marked* with stones, bones, rock art (Steinbring *et al.* [1992]; Smith [1994]; Bradley [1997]; Faulstich [1997]; Nash - Chippendale [2002]; Chippendale - Nash [2004]), or ditches (Norman - Kelly [2004]), thus demonstrating the desire to semantically redirect landscape and to frame it in a conceptual system. In Chukotka, in a circular bay of high cliffs, on the grass of the meadows above, fifteen groups of Greenland whale skulls were discovered, planted vertically, 20-22 meters away from one another, with a fixed alternation of groups of two and four skulls, as well as an avenue of monoliths, a rock amphitheater, ritual paths and stone altars (Arutjunov *et al.* [1983]; Malaurie [1986, 2008]; Krupnik [1987]). In Bohuslän, Sweden, the rocky summit of a hill presents petroglyphs of watercraft that, as a metonymy of water, record the desire to transform the terrestrial elevation into an island, or a threshold to another world (Bradley [2000]). Though they differed from culture to culture, the primary motive for these behaviors was the same: imposing a network of anecdotal, narrative, mythical and cosmological references on the physical world helped the hunter-gatherers memorize and use the cognitive map of the territory on which their survival depended. And vice versa – ecological knowledge was the spontaneous and infinitely fertile substrate of every invention.

The brain of *Homo* evolved to think about landscape and to think of reality as landscape, while hunting functioned as the stimulus and the imprint of this fundamental cognitive module. From apophenia to Bohuslän, the levels of complexity and abstraction are certainly many, but that does not mean that the scholar's work remains a mere linguistic exercise. Wayfinding and cognitive mapping are the biological substrate of the symbolic organization of space, but although they are substantially supported by a genetic platform, they only work because they are qualitative and imagined experiences. For as much as we are accustomed to a western, mathematical topography, in reality we come from a more archaic and universal "fuzzy" topology (Golledge [2003]), in which space is thought of, felt and imagined on the basis of empirical and psychological coordinates such as "density", "sparseness", "nearness", "remoteness", "similarity", "difference", "closure", "openness", "uniformity", "fragmentation", "danger", "security", "pleasantness", "unpleasantness", etc. The ethnographic examples to support these qualitative landscape experiences are numerous, as in the case of the Australian aboriginals, who are given to distinguishing places by "safe" and "dangerous". Safety and danger are a direct result of the Time of Dreams and not of real environmental characteristics, but from this imaginary geographic taxonomy derive very concrete consequences on the dynamic perception of the territory, on who has access to certain places and how, on kinship structure, and on conceptions linked to the birth of individuals (Biernoff [1978]). Gaston Bachelard [1957] stated it definitively: we construct our value system on dialectic topology. But to understand the deeper reason, he would have had to interview a hunter. Many years ago now, William S. Laughlin observed:

While learning to learn, man, the hunter, was learning animal behavior and anatomy, including his own. He domesticated himself first and then turned to other animals and to plants. In this sense, hunting was the school of learning that made the human species self-taught [Laughlin 1968: 320].

Speaking

Some of the ethnographic examples given previously emphasize the central position of language in the construction of cultural landscape. Certainly ecosystem taxonomies, topographic descriptions, toponymy, etiological interpretations and myths about the origins of ancestral lands would not exist without language. But as I point out, it is not only a matter of representation: language functions as a perceptive lens that allows us to penetrate the nuances of certain phenomena and sketch a cognitive network in which these phenomena tend to be spatially ordered. From the hypotheses of Sapir [1983] and Worf [1956] to the ethnopragmatics of Duranti [2007], we are accustomed to thinking of language as a way of structuring perception and knowledge, but it is rare that the accent is placed on the *spatializing* power of lexicon, morphology and syntax. If, as Bachelard [1957] asserted, the image is the spatialization of an idea, we could say that when language evokes, qualifies and organizes images (which is, in practice, always), it is a thought in space and of space. However, although it is rather obvious to assume that different world visions correspond to different deictic systems (Ballester [2006]), it is not as easy to accept the idea that the relationship between space and language is not as arbitrary and conventional as we are accustomed to believe. Without slipping into a linguistic "geodeterminism", we must nevertheless recognize that landscape seems to have provided language with a structuring model (see in particular Basso [1988, 1996]; Tersis - Therrien [1996]; Senft [1997]; Benozzo [2008]; Burenhult - Levinson [2008]; Brown [2008]; Burenhult [2008]; Cablitz [2008]; Enfield [2008]; Levinson [2008]; O'Connor - Kroefges [2008]; O'Meara - Bohnemeyer [2008]; Tamisari [2002, 2008]; Thornton [2008]; Widlok [2008]), as opposed to the common idea that language culturally precedes the perception of the environment (Sapir [1983]). And perhaps the first "syntax" was what hominids and *Homo* had right in front of them for four million years, that is, the ecosystem in its spatialized form, a sort of cognitive "model" that, even before the advent of language, helped to organize thought.

Among the many glottogenetic theories, one of the most in vogue is the one that links the origin of language and the invention of stone tools (Alinei [1996a, 1996b, 1997b]; D'Errico - Blackwell [2005]; Costa [2007]). Recent studies have shown that the fabrication of Olduwan and Acheulean tools by modern experts activate the equivalent of the Broca area in the right cerebral hemisphere, and more generally other areas that are directly involved in the use of language, which suggests that the two activities share the same neurocognitive bases (Stout *et al.* [2008]). The cerebral areas that process spatial data from the environment are

more ancient than those of language, but we must not dismiss the possibility that, in a hunting and gathering context, advantageous cognitive and co-evolutionary interferences were created between "areas of language" and "areas of landscape". This hypothesis seems to be encouraged by the existence of ethnographic languages based on the landscape, or languages that being made for interpreting landscape, derive their very structure from it. In order to understand the difference between languages that are generically "attentive" to landscape and languages that are effectively modeled on it, there are two initial examples worth noting:

> The Wola name different kinds of soil according to observed properties (such as colour, texture, moisture, stoniness and so on), and they can combine and modify these endlessly to build up descriptive classes, referring to "some of this and some of that" and so on (for example *hundbiy sha araytol onduwp* as opposed to *hundbiy araytol* or *hundbiy tongom momonuw araytol haeruw*, which broadly translate "very stony bright-brownish clay" as opposed to "stony bright-brown clay" or "stony bright-brown with gleyed-clay" etc.) [Sillitoe 1996: 272-273].

> Although the territory and subsistence life took place far inland from the Hudson Bay coast, their language – Inuktitut – had a pre-existing geographical concept that organized and oriented the landscape according to the location of the ocean in relation to the flow of the drainage system. This concept, as represented by the binary terms *kangilliq/killiq*, is embedded in the place names of the Harvaqtuurmiut area. […] According to Schneider [1985: 139] *kangilliq* means "thing that is further inland than another." Fortescue *et al.* [1994: 157] agree with this definition and add that the root *kangi* means "bottom of bay, direction towards land, source of river." Schneider [1985: 139] gives the meaning of *killiq* as "what is furthest toward the sea (opposite of *kangilliq*)" [Keith 2004: 52].

While in the case of the Wola the need for a phenomenological classification is satisfied through a specialized lexicon and an elementary combinatory strategy, in the case of the Harvaqtuurmiut, landscape permeates the language so deeply that it completely escapes the awareness of the speaker. The *kangilliq/killiq* pair is amply diffused in the Inuit language and is but a minor example of the remarkable geographical complexity that characterizes it: linguists have not only highlighted aspects such as the variable classification of Inuit deictics and the relativity – embedded in the morphosyntax – of the orientation of the speaker based on the land/sea axis, the axis of the winds or the transverse axis of the coast (Fortescue [1988]), but they have also recognized that endocentric and exocentric functions of localization or orientation are attributed even to single vowel and consonant phonemes. In the case of the Tunumiisut of eastern Greenland, for example, the vowels I, U, and A, when inserted in like morphemes where the consonant remains the same (*-pi-*, *-pu-*, *-pa-*; *-ti-*, *-tu-*, *-ta-*) systematically assume a different spatial meaning, indicating, respectively, permanence, nearness and farness (Tersis [1996]). Here is another eloquent example from the Western Apache of Arizona:

> […] the study of place-name systems reveal a great deal about the cognitive categories with which environmental phenomena are organized and understood. […] By way of illustration, consider the following place-names, which have been segmented into their gross morphological constituents.

Tséé Biká' Tú Yaahil né: *Tséé* (rock, stone) + *Biká'* (on top of it; a flattish object) + *Tú* (water) + *Yaa-* (downward) + *-hi-* (linear succession of regularly repeated movements) + *-l -* (it flows) + *-né* (the one). Translation: Water Flows Down On A Succession Of Flat Rocks. […]
Tséé Hadigaiyé: *Tséé* (rock, stone) + *Ha-* (up and out) + *-di-* (extends in a line) + *-gai-* (white, whiteness) + *-yé* (the one). Translation: Line Of White Rocks Extends Up And Out [Basso 1996: 44, 46].

Why do the Apache so faithfully evoke a site? Is it only a matter of a phenomenological perspective, like that of the Wola, or are there more complex reasons that explain this analytical rendering?

Place-names are used in all forms of Apache storytelling as situating devices, as conventionalized verbal instruments for locating narrated events at and in physical settings where the events occurred. Thus, instead of describing these settings discursively, an Apache storyteller can simply employ their names, and Apache listeners, whether they have visited the sites or not, are able to imagine in some details how they might appear. […] Western Apache place-names provide more than precise depictions of the sites to which the names refer. In addition, place-names implicitly identify positions for viewing these locations: optimal vantage points, so to speak, from which the sites can be observed, clearly and unmistakably, just as their names depict them. To picture a site from its name, then, requires that one imagine it as if standing or sitting at a particular spot, and it is to these privileged positions, Apaches say, that the images evoked by place-names cause them to travel in their minds [Basso 1996: 47, 89].

The connection between language and landscape could not be more complex because it traverses various cognitive levels: 1) *naming* as topographical narration, 2) *linguistic images* as evocation of an invisible place, 3) *place-names* as landmarks of a real or virtual cognitive map. Like the Inuit pair *kangilliq/killiq*, Apache place names serve a wayfinding function, whereby orientation is not only topographical, but also topological, meaning that they help to situate the speaker and the listener in a symbolic geography that can extend to other spheres, such as myth or social structure. Among the Yolngu of the Land of Arnhem, for example, there are toponyms and anthro-toponyms, that is names of places and names of people that express their geographical and mythical location: while the ancestral beings were forming the shapes of the land, they were simultaneously naming them, thus, for the Yolngu terrestrial morphopoiesis and linguistic morphopoiesis are considered one in the same. In this sense, the names of a single person or of a group imply a substantial commonality with an ancestral place, and help to situate man in a precise geographical, totemic, patrilineal and social context (Tamisari [2002, 2008]). It is important to emphasize that it is not a matter of simply incorporating place into name, but in a fully cosmological sense, the conceptual vector is perceived by the Aboriginals as a gemmation of the name *by* the landscape. We find a similar conception among the Umeda of the central plains of Papua New Guinea who, like the Kaluli studied by Feld [1982], can be defined as an "auditory culture" in which soundscape is central to the mental ecosystem. For the Umeda, a name is the sound of that which it designates, or better yet, it is "the shape in articulatory/acoustic space" (Gell [1995: 232]) produced by the thing. The result is a linguistic system where-

in the arbitrary nature of the sign (Saussure [1916]) is reduced, either because of the high presence of onomatopoeia, or because the entire language is considered onomatopoeic. But in the Umeda language there is also a phonological "rationalization" that seems led by topological/topographic axes derived from the environment:

> Lacking a visual landscape, what the Umeda have instead, I would say, is a 'landscape of articulation', a landscape which is accessible, primordially, in the acoustic modality. This landscape is constructed out of the interface between two kinds of experience; distally it comprises a codification of ambient sound, this is a soundscape, proximally it comprises the basic unifying armature of the body as a sounding cavity […]. The fundamental schema of Umeda phonological symbolism can be derived from the following basic mapping. Front (alveolar) consonants are associated with centrality (*edie* = man, *edie* = middle, *edtodna* = male/central moiety), while velar (back) consonants are associated with peripherality (*agwa* = woman, *aga* = ear, *agea* = arm/branch, *agwatodna* = female/peripheral moiety). […] The above/below axis is linked to the phonological contrast between the low/back vowels 'u' and 'o' and the high/front vowels 'a' and 'i'. If we start from the top we have the empyrean (*pai*). The stars are *painauf*. […] The bush, which is 'low' in relation to the village, is *sugut*. The lowest part of the bush are swamps: *pud* [Gell 1995: 240-241, 243].

The idea, therefore, is one of a co-fusion between language and the world that carries a permanent exchange of fluids between the two horizons: language as landscape, landscape as language, in a feedback system in which perception and representation follow one another in a circular motion. Perhaps the scientific confirmation of the existence of a "linguistic cognitive landscaping" can only be provided by what has been defined as "Neuroarchaeology of the Mind" (Malafouris - Renfrew [2008]), but I maintain that some of the observations made in this essay, in particular those on apophenia, can have a direct effect on glottogenetic and ethnolinguisitc theories. The Umeda language, for example, could be described in terms of auditory apophenia, because words are allusively and analogically charged with every sound from the external world, defining their sonorous boundaries and conferring on them a greater substantiality in acoustic space. In the same way, visual apophenia seems to be an important vehicle in the linguistic production of images.

I had occasion to observe this in an experiment conducted on my students, which consisted of projecting images likely to be apophenically interpreted. Some photographs were less "legible" than others, so much so that only a few students "saw" the hidden figure. However, once the object to be distinguished was named, the percentage of recognition increased considerably, proving that language, though not strictly necessary, contributed in a determining way to apophenic recognition. As the French psychologist Pierre Kaufmann observed [1967: 219] of the Rorschach test, the emergence of the act of representation is not simply a perception that the designation of the object follows: in reality, the two moments are simultaneous. The word, therefore, does not "indicate" the thing, but it is consubstantial to its perception. Another example of how, at the evolutionary level, language may have supported and, in turn, been supported by pre-existing neurocognitive faculties, and at the operational level, how

apophenia can function as an "index fossil" to anchor research in historical linguistics and ethnolinguistics to the neurocognitive dimension.

In particular, I believe that apophenia plays a considerable role in what is traditionally called "lexical motivation", and which Mario Alinei calls "iconymy", that is, the recycling of pre-existing words to designate a new referent through metaphorical and metonymical association (Alinei [1997a, 2003, 2009a]). It is precisely in these arbitrary associations that resides the motivation for re-use, and at times the roots of such re-use are less arbitrary than they seem. If, for example, in the Franco-Cantabrian region a man of the Upper Paleolithic saw animals in the rocky morphology of a cave, they were generally horses and bison (rather than giraffes and hippopotamus) because the ecological context and the cultural superstructures pre-selected the range of possible associations. This "surplus value", as Alinei calls it, that is the ideological-cultural-motivational meaning of the word that the linguist must be able to reconstruct, is what in anthropology is called "ethnological context", which allows us to inscribe a single cultural fact in the total system of the culture being studied. Nevertheless, apophenia is a mode of perception/representation that, beyond any given culture, photographs the genesis of the imagination at a primary and universal stage. In the field of "etymological archaeology", Alinei has pointed out numerous examples of what in my opinion can be interpreted as obvious cases of apophenic motivation:

1) European names for "rainbow" can have zoomorphic references and mean "dragon" (Albanian *ylber*), "snake" (Lithuanian *sm kas*), "green belly" (Latvian *delv rdze*), "earth worm" (German in Italy *regenwurm*), "black cow" (Slovenian *mavrica*), "an ox and a cow" (Komi *öškamöška*), "yellow weasel" (Kalmyk *sol g*), "(ox) horn" (Basque *ortzederra*), "intestine of the sky" (Zachur, North Caucasian */han 'ewur/*), "fox's belt" (Khvarsci, North Caucasian */zar 'us æšu/*). The rainbow can also be linked to the action of drinking: "pump" (Romanian *curcub u*, Hungarian *szivárvány*), "trunk (that sucks)" (Lithuanian *straublys*), "drinker" (Udmurt *vujuis*). All of these interpretations of a natural phenomenon are seen in European and extra-European ethnographic contexts and connect the lexical motivation of the rainbow to a gigantic (mythical?) animal that drinks water and returns it in the form of rain (Alinei [1996a: 693-695]).

2) Certain Neolithic tools such as the "shovel", the "hoe", and the "serrated sickle" could be "seen" by ancient farmers in the outline of the Alps, as attested by numerous Italian toponyms, such as "Pale di San Martino", "Pizzo Badile", "Sappada", "Serra", "Resegone", etc. (Alinei [2000: 846-852]).

3) The Latin word *pratum* (meadow) has no etymology, but it can be linked, through the Ligurian *prau*, to *pilatum* (bald), in juxtaposition to the "veil" of the forest in an ideological-cultural context retro-datable to the Neolithic herders of the Ligurian area. For these shepherds the meadow may have resembled the sheered parts of the sheep, or the fact that they practiced burning to obtain pasture land was seen by the shepherds as a sheering of the woods. Inversely the French *pelouse* (lawn) comes from the Latin *pelosa* (hairy), probably in reference to the fur of an animal (Alinei [2000: 961], [2009b]).

4) The Latin *lama* means "marsh, bog, pond" and generated, in some Italian dialects, *lama, lamare, lamatura, slamare,* meaning "swamp land, landslide, inundate, etc.". But the Latin *làmia* means "dragon, monster, feminine serpent" and may be at the origin of a morphological association between curving bodies of water, pebbly river banks, landslides and avalanche corridors on the one hand, and dragons and enormous snakes on the other (Alinei [1989]).

5) The Latin *meridies* (noon) means in almost all of Italy "shady place" or "resting spot", while south of Tevere it is transformed into *morra*, which can mean both "flock" and "pile of rocks". This semantic diffraction can only be explained in apophenic terms, because observing "the flock that rests at noon, all huddled together, and with the sheep that hide their heads under the body of their neighbour, the inevitable effect for the person who sees it from afar, given the color of the sheep, is that of a pile of rocks" (Alinei [2009b]).

In all the examples given, landscape forms are devoid of independent significance but are "recognized" based on apophenic motivation, according to morphological similarities that refer to other environmental and material realities. On the linguistic front, it seems therefore that apophenia participates in a phenomenology of imaginative production, acting as the neurophysiological vehicle of a basic etiology, whose founding moment is the act of naming (places, animals and people). The implications for glottogony, ethnolinguistics and iconymy are varied: 1) as a stem cell of causal thought for images, apophenia may have played an important role in shaping and encouraging the linguistic behavior of *Homo*; 2) its potential evolutionary importance can be traced to the fact that auditory apophenia is heavily involved in babbling, in particular when an adult thinks he recognizes words or fragments of words in random chains of syllables uttered by a baby, and encourages correct division and pronunciation by emphasizing and repeating certain parts of them; 3) the connection between apophenia and language is further confirmed by neurocognitive studies on reading, and in particular by the fact that the Visual Word Form Area, before being re-used for the recognition of letters, evolved for "reading" natural forms (tracks, places, faces), based on analogical procedures similar to those of apophenia (Cohen *et al.* [2000]; Cohen - Dehaene [2004]; Dehaene [2003]; Dehaene *et al.* [2005]); 4) apophenia can be simple or complex, can define pairs or chains of like images, or can support entire isomorphic systems, as in the case of parallelism-homology between body and landscape. The fact that some groups, such as the Inuit, the Australian aboriginals or the inhabitants of the Marquesas Islands embed language in an isomorphic landscape/body/language system suggests that apophenia is the elementary basis of a more complex analogical mode of thought. This implies that 5) apophenia as ideological motivation should be part of the interpretive framework of ethnolinguistic analysis; 6) apophenia as lexical motivation should be systematically explored in the fields of etymology and toponymy.

Conclusion

Apophenia, visions, dreams, hallucinations, *rêverie*, wayfinding, cognitive mapping, sacred geography, etiology and creation myths all find in landscape an ultimate coherent space, at the confluence of fundamental horizons such as physiology and neurophysiology, linguistics and cognitive linguistics, ecology and geomorphology. The fact that certain cultures have developed conceptions on the basis of which the body, language, and place are overlapping universes is reason for reflection. For these peoples landscape accommodates not only a corporal dimension, but also an intrinsic linguistic dimension. In other words, language is in the landscape, or simply *is* the landscape, in a closed system where the landscape is body and language, language is body and landscape, the body is language and landscape. Glottogony, cosmogony and human origins thus belong to a single mythical flux that words, in their narrative dimension, keep in motion. Regardless of the most complex of cultural disguises, this is a profound cognitive structure in which the permanent exchange of fluids between "earthscape", "bodyscape", and "tonguescape" (Meschiari [2008a, 2008d] is the historical and logical *prius* of the savage mind, that is, ours. Body, landscape and language, reflecting one another, are the primary paradigm of our species to interpret the complexity of reality*.

REFERENCES

Alinei, M. [1989], *Geografia semantica: continuatori di* draco *in Italia e in Francia*, in *Espaces Romans: études de dialectologie et de géolinguistique offertes à Gaston Tuaillon*, vol. II, Grenoble, Ellug, Université Stendal, pp. 459-487.
– [1996a], *Origini delle lingue d'Europa. La Teoria della Continuità*, Bologna, il Mulino.
– [1996b], *The correlation between lithic and linguistic develoment: a geolinguist's view*, in F. Facchini (ed.), *Colloquium VIII: Lithic industries, language and social behaviour in the first human forms, The colloquia of the XIII international congress of prehistoric and protohistoric sciences*, (Forlì 8-14/9/1996), Forlì, Abacus, pp. 107-116.
– [1997a], *Principi di teoria motivazionale (iconimia) e di lessicologia motivazionale (iconomastica)*, in *Atti del XX Convegno della SIG* (Chieti-Pescara Ottobre 1995), pp. 11-36.
– [1997b], *Geolinguistic and other lines of evidence for the correlation between lithic and linguistic development* in «Europaea», 3, pp. 15-38.
– [2000], *Origini delle lingue d'Europa. Continuità dal Mesolitico all'età del Ferro nelle principali aree etnolinguistiche*. Bologna, il Mulino.
– [2003], *The Role of Motivation ("iconymy") in Naming: Six Responses to a List of Questions*, in G. Sanga, G. Ortalli (eds.), *Nature Knowledge, Ethnoscience, Cognition, and Utility*, Oxford-New York, Berghahn Books, pp. 108-118.
– [2008], *Commento* a Tamisari [2008], «Quaderni di Semantica», 58, pp. 255-262.
– [2009a], *L'origine delle parole*, Roma, Aracne Editrice.
– [2009b], *Da lat.* meridies *'meriggio delle pecore', a lat.* mora *e lat.* umbra*: origini italiche*

* This article, as well as quotations from sources in French, was translated from the Italian by Ann Kilgo. The author would like to thank Mario Alinei and Francesco Benozzo for their helpful advice, and Dr. Hilburn Hillestad and Dr. Robert Benson for their encouragement.

e sviluppo ligustico di un termine della pastorizia transumante, «Quaderni di Semantica» 59/1 (in press).
Arutjunov, S.A. - Krupnik, I.I. - Clenov, M.A. [1983], *L'Allée des Baleines, site cultuel de l'ancienne culture esquimaude sur l'île Ittygran*, «Sibériana 1983», Paris, CNRS, pp. 141-161.
Atran, S. [1998], *Folkbiology and anthropology of science: Cognitive universals and cultural particulars*, in «Behavioral and Brain Sciences» 21, pp. 547-609.
– [1990], *Cognitive Foundation of Natural History*, New York, Cambridge University Press.
Atran, S. - Medin, D. (eds.) [1999], *Folkbiology*, Cambridge, Massachusetts Institute of Technology Press.
– [2008], *The Native Mind and the Cultural Construction of Nature*, Cambridge, Massachusetts Institute of Technology Press.
Atran, S. - Medin, D. - Ross, N. - Lynch, E. - Coley, J. - Ucan Ek', E. - Vapnarsky, V. [1999], *Folkecology and commons management in the Maya lowlands*, «Proceedings of the National Academy of Sciences, U.S.A.» 96, pp. 7598-7603.
Averkieva, J. - Sherman, M.A. [1992], *Kwakiutl String Figures*, Seattle, University of Washington Press.
Bachelard, G. [1957], *La poétique de l'espace*, Paris, Presses Universitaires de France. Translated as: *The Poetics of Space*, New York, Orion Press, 1964.
Ballester, X. [2006], *In Principio Era il Dimostrativo*, «Quaderni di Semantica» 27, pp. 13-30.
Basso, K.H. [1988], *"Speaking with names": Language and landscape among the Western Apache*, «Cultural Anthropology» 3, pp. 99-130.
– [1996], *Wisdom Sits in Places. Landscape and Language among the Western Apache*, Albuquerque, University of New Mexico Press.
Bastien, J.W. [1985], *Qollahuaya-Andean Body Concepts: A Topographical-Hydraulic Model of Physiology*, «American Anthropologist» 87/3, pp. 595-611.
Benozzo, F. [2004], *Landscape Perception in Early Celtic Literature*, Aberystwyth: Celtic Studies Publications.
– [2007], *Etnofilologia*, «Ecdotica» 4, pp. 208-230.
– [2008], *Commento* a Tamisari [2008], «Quaderni di Semantica», 58, pp. 263-270.
Berkes, F. [1999], *Sacred Ecology. Traditional Ecological Knowledge and Resource Management*, Philadelphia, Tylor & Francis.
Berlin, B. [1992], *Ethnobiological Classification: Priciples of Categorization of Plants and Animals in Traditional Societies*, Princeton, Princeton University Press.
Bettinger, R.L. [1991], *Hunter-Gatherers. Archaeological and Evolutionary Theory*, New York-London, Plenum Press.
Bicca-Marques, J.C. - Garber, P.A. [2004], *Use of Spatial, Visual, and Olfactory Information During Foraging in Wild Nocturnal and Diurnal Anthropoids: A Field Experiment Comparing* Aotus*,* Callicebus*, and* Saguinus, «American Journal of Primatology» 62, pp. 171-187.
Biernoff, D. [1978], *Safe and dangerous places*, in L.R. Hiatt (ed), *Australian Aboriginal concepts*, Canberra, Australian Institute of Aboriginal Studies, pp. 93-105.
Blakemore, M. [1981], *From Way-Finding to Map-Making: the Spatial Information Fields of Aboriginal People*, «Progress in Human Geography» 5, pp. 1-24.
Boivin, N. - Owoc, M.A. [2004], *Soils, Stones and Symbols. Cultural Perceptions of the Mineral World*, London, UCL Press.
Bradley, R.J. [1997], *Rock Art and the Prehistory of Atlantic Europe. Signing the Land*, London-New York, Routledge.
– [2000], *An Archaeology of Natural Places*, London-New York, Routledge.
Brody, H. [1988], *Maps and Dreams. Indians and the British Columbia Frontier*, Prospect Heights, Illinois, Waveland Press.
– [2000], *The Other Side of Eden. Hunters, Farmers, and the Shaping of the World*, New York, North Point Press.

Brown, P. [2008], *Up, down, and across the land: landscape terms, place names, and spatial language in Tzeltal*, in Burenhult - Levinson [2008a], pp. 151-181.
Brugger, P. [2001], *From Haunted Brain to Haunted Science: A Cognitive Neuroscience View of Paranormal and Pseudoscientific Thought*, in J. Houran - R. Lange (eds.), *Hauntings and Poltergeists*, North Carolina, McFarland & Company, pp. 195-213.
Brugger, P. - Surbeck, W. - Loetscher, T., [2007], *Pseudoneglect in representational space: effects of magical ideation*, «Acta Neuropsychologica» 5, pp. 1-7.
Burenhult, N. [2008], *Streams of words: Hydrological lexicon in Jahai*, in Burenhult - Levinson [2008a], pp. 182-199.
Burenhult, N. - Levinson, C. (eds.) [2008a], *Language and landscape: geographical ontology in cross-linguistic perspective*, «Language Sciences» 30/2-3
Burenhult, N. - Levinson, S.C. [2008b], *Language and landscape: a cross-linguistic perspective*, in Burenhult - Levinson [2008a], pp. 135-150.
Buttitta, A. [1996], *Dei segni e dei miti. Un'introduzione all'antropologia simbolica*, Palermo, Sellerio.
Cablitz, G.H. [2008], *When "what" is "where": A linguistic analysis of landscape terms, place names and body part terms in Marquesan (Oceanic, French Polynesia)*, in Burenhult - Levinson [2008a], pp. 200-226.
Cheng, K. [1986], *A purely geometric module in the rats spatial representation*, «Cognition» 23, pp. 149-178.
Chippindale, C. - Nash, G. [2004], *The Figured Landscapes of Rock-Art: Looking at Pictures in Place*, Cambridge, Cambridge University Press.
Clottes, J. - Lewis-Williams, D. [1998], *The Shamans of the Prehistory*, New York, Harry N. Abrams.
Cohen, L. - Dehaene, S. [2004], *Specialization within the ventral stream: the case for the visual word form area*, «NeuroImage 2004», pp. 466-476.
Cohen, L. - Dehaene, S. - Naccache, L. - Lehéricy, S. - Dehaene-Lambertz, G. - Hénaff, M.-A. - Michel, F. [2000], *The visual word form area. Spatial and temporal characterization of an initial stage of reading in normal subjects and posterior split-brain patients*, «Brain» 123, pp. 291-307.
Conkey, M.W. [1984], *To find ourselves: Art and social geography of prehistoric hunter-gatherers*, in C. Scurire (ed), *Past and present in hunter-gatherers studies*, New York, Academic Press, pp. 253-276.
Conrad, K. [1958], *Die beginnende Schizophrenie. Versuch einer Gestaltanalyse des Wahns*, Stuttgart, Thieme.
Corrigan, R. - Denton, P. [1996], *Casual Understanding as a Developmental Primitive*, «Development Review» 16, pp. 162-202.
Costa G. [1992], *Anemonimi benacensi. Lessico, cognizione e tassonomia*, Perugia, Centro stampa dell'Ateneo.
– [2003], *"Extra epistemologiam nulla salus", o sullo status scientifico della linguistica*, «Quaderni di Semantica» 24/2, pp. 229-277.
– [2007], *Recensione* a F. d'Errico – L. Backwell (eds), *From Tools to Symbols: From Early Hominids to Modern Humans*, Johannesburg, Wits University Press, 2005, «Quaderni di Semantica», 28/1, pp. 228-239.
– [2008], *La sirena di Archimede. Etnolinguistica comparata e tradizione preplatonica*, Alessandria, Edizioni dell'Orso.
Cox B. (ed) [1973], *Cultural Ecology. Readings on the Canadian Indians and Eskimos*, Toronto, McClelland and Stewart.
D'Errico, F. - Backwell, L. (eds) [2005], *From Tools to Symbols: From Early Hominids to Modern Humans*, Johannesburg, Wits University Press.
Dehaene, S. [2003], *Les bases cérébrales d'une acquisition culturelle: la lecture*, in J-.P. Changeux (ed), *Gènes et Culture. Enveloppe génétique et variabilité culturelle*, Paris, Odile Jacob, pp. 187-199.
Dehaene, S. - Duhamel, J.R. - Hauser, M. - Rizzolatti, G. (eds.) [2005], *From Monkey*

Brain to Human Brain. A Fyssen Foundation Symposium, Cambridge, MA, Massachusetts Institute of Technology Press.
Desalle, R. - Tattersall, I. [2008], *Human Origins: What Bones and Genomes Tell Us About Ourselves*, College Station,Texas A&M University Press.
Descola P. [1994], *In the Society of Nature. A Native Ecology in Amazonia*, Cambridge, Cambridge University Press.
Duranti, A. [2007], *Etnopragmatica. La forza nel parlare*, Roma, Carocci.
Ellen, R.F. [2006a], *The Categorical Impulse. Essays on the Anthropology of Classifyng Behavior*, Oxford, Berghahn Books.
– [2006b], *Ethnobiology and the Science of Humankind*, Oxford, Blackwell.
El-Mallakh, S. [2006], *Schizophrenia and the origins of shamanism among the Kwakiutl maritime cultures of Northwest North America: A hypothesis*, «Schizophrenia research» 86/1-3, pp. 329-330.
Enfield, N.J. [2008], *Linguistic categories and their utilities: The case of Lao landscape terms*, in Burenhult - Levinson [2008a], pp. 227-255.
Epstein, R. - Harris, A. - Stanley, D. - Kanwisher, N. [1999], *The Parahippocampal Place Area: Recognition, Navigation, or Encoding?*, «Neuron» 23, pp. 115-125.
Epstein, R.A. - Parker, W.E. - Feiler, A.M. [2007], *Where Am I Now? Distinct Roles for Parahippocampal and Retrosplenial Cortices in Place Recognition*, «The Journal of Neuroscience» 27/23, pp. 6141-6149.
Falk, R. - Konold, C. [1997], *Making Sense of Randomness: Implicit Encoding as a Bias for Judgment*, «Psychological Review» 104, pp. 301-318.
Farris Thompson, R. [1983], *Painting from a Single Heart. Preliminary Remarks on Bark-Cloth Designs of the Mbute Women of Haut-Zaïre*, München, Fred und Jens Jahn.
Farris Thompson, R. - Bahuchet, S., [1991], *Pygmées? Peintures sur écorce battue des Mbuti (Haut-Zaïre)*, Musée Dapper, Paris.
Faulstich, P. [1997], *Rock Art as Visual Ecology*, Tucson, American Rock Art Research Association.
Feld, S. [1982], *Sound and Sentiment: Birds, Weeping, Poetics and Song in Kaluli Expression*, Philadelphia, University of Pennsylvania Press.
Fiedel, S.J. - Anthony, D.W. [2003], *Deerslayers, Pathfinders, and Icemen. Origins of the European Neolithic as seen from the frontier*, in M. Rockman - J. Steele (eds.), *Colonization of Unfamiliar Landscapes. The Archaeology of Adaptation*, London-New York, Routledge, pp. 144-168.
Fodor, J. [1983], *The Modularity of Mind*, Cambridge, MA, Massachusetts Institute of Technology Press.
Fortescue, M. [1988], *Eskimo Orientation Systems*, København, Meddelelser om Grønland, Man and Society 11.
Fortescue. M. - Jacobson, S. - Kaplan, L. [1994], *Comparative Eskimo Dictionary: With Aleut Cognates*, Fairbanks, University of Alaska Fairbanks, Alaska Native Language Center, Research Paper, 9.
Harris F. - Kelley K. [2005], *Traditional Navajo maps and wayfinding*, «American Indian Culture and Research Journal» 29, pp. 85-111.
Frison, G.C. [2004], *Survival by Hunting. Prehistoric Human Predators and Animal Prey*, Berkeley, University of California Press.
Fullagar, R. - Head, L. [1999], *Exploring the prehistory of hunter-gatherers attachment to place: an example from the Keep River area, Northern Territory, Australia*, in P. Ucko - R. Layton (eds.), *The Archaeology and Anthropology of Landscape: Shaping your Landscape*, London, Routledge, pp. 322-335.
Furness Jayne, C. [1962], *String Figures and How to Make Them. A Study of Cat's-Cradle in Many Lands*, New York, Dover Publications (1906).
Fyfe, S. - Williams, C. - Mason, O.J. - Pickup, G.J. [2008], *Apophenia, theory of mind and schizotypy: Perceiving meaning and intentionality in randomness*, «Cortex» 44/10, pp. 1316-1325.

Gell, A. [1995], *The Language of the Forest: Landscape and Phonological Iconism in Umeda*, in E. Hirsch - M. O'Hanlon (eds.), *The Anthropology of Landscape: Perspectives on Place and Space*, Oxford, Oxford University Press, pp. 232-254.
Gill, H.S. - O'Boyle M.W. [2003], *Generating an image from an ambiguous visual input: An electroencephalograhic (EEG) investigation*, «Brain and Cognition» 51/3, pp. 287-293.
Golledge, R.G. (ed) [1993], *Wayfinding Behavior. Cognitive Mapping and Other Spatial Processes*, Baltimore, The Johns Hopkins University Press.
– [2003], *Human wayfinding and cognitive maps*, in M. Rockman - J. Steele (eds.), *Colonization of Unfamiliar Landscapes. The Archaeology of Adaptation*, London-New York, Routledge, pp. 25-43.
Graziosi, P. [1960], *Palaeolithic art*, London, Faber and Faber.
Guthrie, S.E. [1993], *Faces in the Clouds. A New Theory of Religion*, New York-Oxford, Oxford University Press.
Haen, N. - Wilk, R.R. (eds.) [2006], *The Environment in Anthropology. A Reader in Ecology, Culture, and Sustainable Living*, New York, New York University Press.
Haken, H. [1979], *Pattern Formation by Dynamic Systems and Pattern Recognition*, Berlin, Springer.
Harkin, M.E. - Lewis, D.R. (eds.) [2007], *Native Americans and Environment. Perspectives on the Ecological Indian*, Lincoln, University of Nebraska Press.
Harris, P.L. [2000], *The Work of the Imagination*, Oxford, Blackwell.
Henderson, J.M. - Larson C.L. - Zhu, D.C. [2007], *Cortical activation to indoor versus outdoor scenes: an fMRI study*, «Experimental brain research» 179/1, pp. 75-84.
– [2008], *Full Scenes Produce More Activation than Close-Up Scenes and Scene-Diagnostic Objects in Parahippocampal and Retrosplenial Cortex: An fMRI Study*, «Brain and Cognition» 66/1, pp. 40-49.
Hewlett, B.S. - Lamb, M. (eds.) [2005], *Hunter-Gatherer Childhoods. Evolutionary, Developmental and Cultural Perspectives*, New Brunswick-London, Transaction Publishers.
Hirsch, E. - O' Hanlon, M. (eds.) [1995], *The Anthropology of Landscape: Perspectives on Place and Space*, Oxford, Oxford University Press.
Hirschfeld, L. - Gelman, S. (eds.) [1994], *Mapping the Mind: Domain Specificity in Cognition and Culture*, New York, Cambridge University Press.
Ingold, T. [2000], *The Perception of the Environment. Essays on Livelihood, Dwelling and Skill*, London, Routledge.
Jones, E. [1986], *Koyukon Ethnogeography*, Anchorage, Alaska Historical Commission.
Kaufmann, P. [1999], *L'expérience émotionnelle de l'espace*, Paris, Vrin.
Keith, D. [2004], *Caribou, river and ocean: Harvaqtuurmiut landscape organization and orientation*, «Études/Inuit/Studies» 28/2, pp. 39-56.
Kelly, R.L. [2003], *Colonisation of new land by hunter-gatherers. Expectations and implications based on ethnographic data*, in M. Rockman - J. Steele (eds.), *Colonization of Unfamiliar Landscapes. The Archaeology of Adaptation*, London-New York, Routledge, pp. 44-58.
– [2007], *The Foraging Spectrum. Diversity in Hunters-Gatherers Lifeways*, New York, Percheron Press (1995).
Kelso, J.A.S. [1995], *Dynamic Patterns: The Self-Organization of Brain and Behaviour*, Boston, MIT Press.
Krech, S. [1999], *The Ecological Indian. Myth and History*, New York-London, Norton & Company.
Krippner, S. - Combs, A. [2002], *The Neurophenomenology of Shamanism. An Essay Review*, «Journal of Consciousness Studies» 9/3, pp. 77-82.
Krupnik, I.I. [1987], *The Bowhead vs. the Gray Whale in Chukotkan Aboriginal Whaling*, «Artic» 40/1, pp. 16-32.
Kruse, P. - Stadler, M. (eds.) [1995], *Ambiguity in Mind and Nature: Multistable Cognitive Phenomena*, Berlin, Springer.

Lahelma, A. [in press]: *Communicating with "Stone persons": Anthropomorphism, Saami Religion and Finnish Rock Art*, in E. Walderhaug - L. Forsberg (eds.), *Cognition and Signification in Northern Landscapes*, UBAS, International Series.
Laughlin, W.S. [1968], *Hunting: An Integrating Biobehavior System and Its Evolutionary Importance*, in R.B. Lee - I. De Vore (eds.), *Man the Hunter. The First Intensive Survey of a Single, Crucial Stage of Human Development – Man's Once Universal Hunting Way of Life*, Chicago, Aldine Publishing Company, pp. 304-320.
– [2004], *Acquisition of Anatomical Knowledge by Ancient Men*, in S.L. Washburn (ed), *Social Life of Early Man*, London-New York, Routledge (1962), pp. 150-175.
Layton, R. [1995], *Relating to the Country in the Western Desert*, in E. Hirsch - M. O'Hanlon (eds.), *The Anthropology of Landscape: Perspectives on Place and Space*, Oxford, Oxford University Press, pp. 210-231.
– [1999], *The Alawa totemic landscape: ecology, religion and politics*, in P. Ucko - R. Layton (eds.), *The Archaeology and Anthropology of Landscape: Shaping your Landscape*, London, Routledge, pp. 219-239.
Lee, D. [1950], *Lineal and Nonlineal Codifications of Reality*, Indianapolis, The Bobbs-Merrill Reprint Series in Social Sciences.
Lee, R.B. - Daly, R. (eds) [1999], *The Cambridge Encyclopedia of Hunters and Gatherers*, Cambridge, Cambridge University Press.
Lee, R.B. - De Vore, I. (eds.) [1968], *Man the Hunter. The First Intensive Survey of a Single, Crucial Stage of Human Development – Man's Once Universal Hunting Way of Life*, Chicago, Aldine Publishing Company.
Lejeune, M. [1981], *L'utilisation des accidents naturels dans le tracé des figurations pariétales du Paléolithique supérieur franco-cantabrique*, Mémoire de fin d'études, Université de Liège.
Leonhard, D. - Brugger, P. [1998], *Creative, paranormal, and delusional thought: A consequence of right hemisphere semantic activation?* in «Neuropsychiatry, Neuropsychology, and Behavioral Neurology» 11/4, pp. 177-183.
Leopold, D.A. - Logothetis, N.K. [1999], *Multistable phenomena: changing views in perception*, «Trends in Cognitive Sciences» 3/7, pp. 254-264.
Leopold, D.A. - Wilke, M. - Maier A. - Logothetis, N.K. [2002], *Stable perception of visually ambiguous patterns*, «Nature neuroscience» 5/6, pp. 605-609.
Leroi-Gourhan, A. [1982], *The down of European art: An introduction to Palaeolithic cave painting*, Cambridge, Cambridge University Press.
Levinson, S.C. [2008], *Landscape, seascape and the ontology of places on Rossel Island, Papua New Guinea*, in Burenhult - Levinson [2008a], pp. 256-290.
Lévi-Strauss, C. [1962], *La pensée sauvage*, Paris, Plon. Translated as: *The Savage Mind*, Chicago, University of Chicago Press, 1968.
Lewis-Williams, J.D. - Dowson, T.A [1988], *The Signs of All Times, Entoptic Phenomena in Upper Palaeolithic Art*, «Current Anthropology» 29, pp. 201-245.
Lewis-Williams, D. [2002], *The Mind in the Cave. Consciousness and the Origins of Art*, London, Thames and Hudson.
Lex, B.W. [1984], *The Context of Schizophrenia and Shamanism*, «American Ethnologist» 11/1, pp. 191-192.
Lorblanchet, M. [1993], *Le support*, in *L'art pariétal paléolithique. Techniques et méthodes d'étude*, Paris, Ministère de l'Enseignement Supérieur et de la Recherche, pp. 69-80.
– [1995], *Les grottes ornées de la préhistoire*, Paris, Errance.
– Lorblanchet, M. [1999], *La naissance de l'art. Genèse de l'art préhistorique dans le monde*, Paris, Errance.
Lowton, C.A. - Charleston, S.I. - Zieles, A.S. [1996], *Individual and gender-related differences in indoor wayfinding*, «Environment and Behavior» 28/2, pp. 204-219.
Malafouris, L - Renfrew, C. [2008], *Steps to a 'Neuroarchaeology' of Mind*, «Cambridge Archaeological Journal» 18/3, pp. 381-385.

Malaurie, J. [1986], *Une autre lecture de l'espace artique pour une géographie sacrée des lieux*, in *Ethnologie et anthropogéographie artique*, Paris, CNRS, pp. 159-177.
– [2008], *L'Allée des baleines*, Paris, Mille et une nuits.
Martin L. [1986], *Eskimo Words for Snow: A Case Study in the Genesis and Decay of an Anthropological Example*, «American Anthropologist» 88/ 2, pp. 418-423.
Menzies, C.R. (ed) [2006], *Traditional Ecological Knowledge and Natural Resource Management*, Lincoln, University of Nebraska Press.
Meschiari, M. [1999], *Espace et cosmologie dans l'art préhistorique. L'hypothèse chamanique*, «Préhistoire Ariégeoise. Bulletin de la Société Préhistorique Ariège-Pyrénées» 54, pp. 221-233.
– [2004], *Lineamenti di archeologia dello spazio. Per un'analisi dell'arte rupestre*, «Archivio Antropologico Mediterraneo» 6-7, pp. 61-86.
– [2008a], *"Terra sapiens". Per una preistoria del paesaggio*, «Quaderni di Semantica», 57/1, pp. 149-162.
– [2008b], *Sistemi selvaggi. Antropologia de paesaggio scritto*, Palermo, Sellerio.
– [2008c], *"Tapa Mbuti". Antropologia dell'astratto*, «Archivio antropologico mediterraneo», 10-11, pp. 139-148.
– [2008d]. *Commento* a Tamisari [2008], «Quaderni di Semantica», 58, pp. 277-280.
Meurant, G. - Farris Thompson, R. [1996], *Mbuti Design, Paintings by Pygmy Women of the Ituri Forest*, New York, Thames and Hudson.
Minor, S.W. - White, H. - Owings, E.P. [1989], *Hemispheric asymmetries in interpreting forms vs colors in ambiguous patterns*, «Brain and Cognition» 9/1, pp. 123-135.
Mithen, S. [1996], *The Prehistory of the Mind. The Cognitive Origins of Art and Science*, London-New York, Thames and Hudson.
– [1998], *Creativity in Human Evolution and Prehistory*, London, Routledge.
– [2006], *The Singing Neanderthals. The Origins of Music, Language, Mind and Body*. Cambridge: Harvard University Press.
Mohr, C. - Landis, T. - Sandor, P.S. - Fathi, M. - Brugger, P. [2004], *Nonstereotyped responding in Positive Schizotypy after a single dose of Levodopa*, «Neuropsychopharmacology» 29, pp. 1741-1751.
Morphy, H. [1991], *Ancestral Connections. Art and an Aboriginal System of Knowledge*, Chicago, Chicago University Press.
– 1995, *Landscape and the Reproduction of the Ancestral Past*, in E. Hirsch - M. O'Hanlon (eds.), *The Anthropology of Landscape: Perspectives on Place and Space*, Oxford, Oxford University Press, pp. 184-209.
Munn, N.D. [1984], *The Transformation of Subject into Objects in Walbiri and Pitjantjatjara Myth,* in M. Charlesworth - H. Morphy - D. Bell - K. Maddock, *Religion in Aboriginal Australia. An Anthology*, London-New York, University of Queensland Press, pp. 57-82.
Nabokov, P. [2006], *Where the Lightning Strikes. The Lives of American Indian Sacred Places*, New York, Viking.
Nash, G. - Chippindale, C. (eds.) [2002], *European Landscapes of Rock-Art*, London-New York: Routledge.
Nazarea, V.D. (ed) [1999], *Ethnoecology. Situated Knowledge/Located Lives*, Tucson, The University of Arizona Press.
Nelson, R.K. [1983], *Make Prayers to the Raven. A Koyukon View of the Northern Forest*, Chicago-London, The University of Chicago Press.
Noll, R. [1983], *Shamanism and Schizophrenia: A State-Specific Approach to the "Schizophrenia Metaphor" of Shamanic States*, «American Ethnologist» 10/3, pp. 443-459.
O'Connor, L. - Kroefges, P.C. [2008], *The land remembers: landscape terms and place names in Lowland Chontal of Oaxaca, Mexico*, in Burenhult - Levinson [2008a], pp. 291-315.
O'Craven, K.M. - Kanwisher, N. [2000], *Mental Imagery of Faces and Places Activates Corresponding Stimulus-Specific Brain Regions*, «Journal of Cognitive Neuroscience» 12/ 6, pp. 1013-1023.

O'Meara, C. - Bohnemeyer, J. [2008], *Complex landscape terms in Seri*, in Burenhult - Levinson [2008a], pp. 316-339.
Ortega y Gasset, J. [1943], *Sobre la caza*, prólogo a *Veinte años de caza mayor*, por el conde de Yebes, Madrid, Espasa-Calpe.
Panter-Brick, C. - Layton, R.H. - Rowley-Conwy, P. (eds.) [2001], *Hunter-Gatherers. An Interdisciplinary Perspective*, Cambridge, Cambridge University Press.
Petchkovsky, L. [2008], *Some Preliminary Reflections on the Biological Substrate of Meaning-Making*, in A. Dowd - C. San Roque - L. Petchkovsky (eds), *The Uses of subjective experience. Proceedings of the Conference 'The Uses of Subjective Experience: A Weekend of Conversations between ANZSJA Analysts and Academics who Work with Jung's Ideas'* (October 20-21, 2007), Melbourne-Sydney, The Australian & New Zealand Society of Jungian Analysts, pp. 243-252 (e-book).
Piaget, J. [2005], *La représentation du monde chez l'enfant*, Paris, Presses Universitaires de France. First edition: Paris, Alcan, 1926. Translated as: *The Child's Conception of the World*, London, Routledge & Kegan Paul, 1929.
Pizzagalli, D. - Lehmann, D. - Brugger, P. [2001], *Lateralized Direct and Indirect Semantic Priming Effects in Subjects with Paranormal Experiences and Beliefs*, «Psychopathology» 34/2, pp. 75-80.
Polimeni, J. - Reiss, J.P. [2002], *How shamanism and group selection may reveal the origins of schizophrenia*, «Medical Hypotheses» 58/ 3, pp. 244-248.
Randa, V. [1996], *Différencier pour mieux rapprocher. Conceptualisation de la faune chez les Iglulingmiut et dynamique de la pensée analogique*, in N. Tersis - M. Therrien (eds.), *La dynamique dans la langue et la culture inuit*, Paris, Peeters, pp. 95-118.
Renfrew C. [2007], *Prehistory: The Making of the Human Mind*, London, Weidenfeld & Nicolson.
Rockman, M. - Steele, J. (eds.) [2003], *Colonization of Unfamiliar Landscapes. The Archaeology of Adaptation*, London-New York, Routledge.
Sanga G., [1997a], *L'appaesamento linguistico. Una teoria glottogonica*, «Quaderni di Semantica» 35/1, pp. 13-63.
– [1997b], *The Domestication of Speech: Towards a Theory of Glottogony*, «Europaea» 3, pp. 65-120.
Sapir, E. [1983], *Selected Writings of Edward Sapir in Language, Culture, and Personality*, edited by D.G. Mandelbaum, Berkeley, University of California Press.
Saussure, F. de [1916], *Cours de linguistique générale*, Lausanne-Paris, Payot. Translated as: *Course in General Linguistics*, Glasgow, Fontana/Collins, 1977.
Schlottmann, A. [2001], *Perception versus Knowledge of Cause-and-Effect in Children: When Seeing is Beliving*, in «Current Directions in Psychological Science» 10, pp. 111-115.
Schneider, L. [1985], *Ulirnaisigutiit: An Inuktitut-English Dictionary of Northern Quebec, Labrador and Eastern Arctic Dialects*, Quebec, Les Presses de l'Université Laval.
Senft, G. (ed.) [1997], *Referring to Space: Studies in Austronesian and Papuan Languages*, Oxford, Oxford University Press.
Shepard, P. [1998a], *The Tender Carnivore and the Sacred Game*, Athens-London, The University of Georgia Press. First edition 1973.
– [1998b], *Thinking Animals. Animals and the Development of Human Intelligence*, Athens-London, The University of Georgia Press [first edition 1978].
Sillitoe, P. [1996], *A Place Against Time. Land and Environment in the Papua New Guinea Highlands*, Amsterdam, Harwood Academic Press.
Silverman, J. [1967], *Shamans and Acute Schizophrenia*, «American Anthropologist» 69/1, pp. 21-31.
Smith, A.B. [1994], *Metaphors of Space, Rock Art and territoriality in Southern Africa*, in T.H. Dowson - D. Lewis-Williams (eds), *Contested Images. Diversity in Southern African rock art research*, Johannesburg, Witwatersrand University Press, pp. 373-384.
Smith, C. [1999], *Ancestors, place and people: social landscapes in Aboriginal Australia*, in P. Ucko, - R. Layton (eds.), *The Archaeology and Anthropology of Landscape: Shaping your Landscape*, London, Routledge, pp. 189-205.

Sperber, D. [1996], *Explaining culture. A naturalistic approach*, Oxford, Blackwell.
Spink, J. - Moodie, D.W. [1972], *Eskimo Maps from the Canadian Eastern Artic*, Toronto, University of Toronto Press (*Cartographica* 5).
Steinbring, J. - Watchman, A. - Faulstich, P. - Taçon, P. (eds.) [1992], *Time and Space. Dating and Spatial Considerations in Rock Art Research*, Melbourne, Australian Rock Art Research Association.
Stone, L. - Lurquin, P.F. - Cavalli-Sforza, L.L. [2007], *Genes, Culture, and Human Evolution: A Synthesis*, Malden-Oxford, Wiley-Blackwell.
Stout, D. - Chaminade, T. [2007], *The Evolutionary Neuroscience of Tool Making*, «Neuropsychologia» 45, pp. 1091-1100.
Stout, D. - Toth N. - Schick K.D. - Chaminade T. [2008], *Neural correlates of Early Stone Age tool-making: technology, language and cognition in human evolution*, «Philosophical Transactions of the Royal Society of London B» 363, pp. 1939-1949.
Strier, K.B. [2007], *Primate Behavioral Ecology*, Boston, Allyn and Bacon.
Surrallés A. - García Hierro P. (eds.) [2005], *The Land Within: Indigenous Territory and the Perception of Environment*, Classensgade, International Work Group for Indigenous Affairs.
Tamisari, F. [2002], *Names and naming. Speaking forms into Place*, in L. Hercus - F. Hodges - J. Simpson (eds.), *The Land is a Map: Placenames of Indigenous Origin in Australia*, Canberra, Pandanus Press, pp. 87-102.
– [2008], *L'atto di nominare e il potere morfopoietico dei nomi e dei toponimi nella cosmogonia yolngu, Terra di Arnhem nordorientale, Australia*, «Quaderni di Semantica» 29, pp. 231-254.
Tersis, N. [1996], *Le couple statique-dynamique dans la langue du Groenland oriental*, in N. Tersis - M. Therrien (eds), *La dynamique dans la langue et la culture inuit*, Paris, Editions Peeters, pp. 75-93.
Tersis, N., Therrien, M. (eds.) [1996], *La dynamique dans la langue et la culture inuit*, Paris, Editions Peeters.
Thornton, T. [2008], *Being and Place among the Tlingit*, Seattle, University of Washington Press.
Tilley, C. [1994], *A Phenomenology of Landscape. Places, Path and Monuments*, Oxford, Berg.
– [2004], *The Materiality of Stone: Explorations in Landscape phenomenology*, Oxford, Berg.
Tooby, J. - Cosmides, L. [1992], *The Psychological Foundation of Culture*, in J. Barkow - L. Cosmides - J. Tooby (eds.), *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, New York, Oxford University Press, pp. 19-136.
Turnbull, C.M. [1965], *The Mbuti Pygmies: an Ethnographic Survey*, American Museum of Natural History, New York.
Ucko, P. - Layton, R. (eds.) [1999], *The Archaeology and Anthropology of Landscape: Shaping your Landscape*, London, Routledge.
Waal, F. de (ed) [1998], *Tree of Origin. What Primate Behaviour Can Tell Us about Human Social Evolution*, Cambridge, Harvard University Press.
Whorf, B.L. [1956], *Language, Thought, and Reality: Selected Writings of Benjamin Lee Whorf*, edited by John Carroll, Cambridge MA, MIT Press.
Widlok, T. [2008], *Landscape Unbounded: Space, Place, and Orientation in ≠Akhoe Hai//om and Beyond*, in N. Burenhult - Levinson [2008a], pp. 362-380.
Winkelman, M. [2000], *Shamanism: The Neural Ecology of Consciousness and Healing*, Westport, CT: Bergin & Garvey/Greenwood.
Wordsworth, W. [1850], *The Prelude*, London, Edward Moxon.
Wolpert, L. [2006], *Six Impossible Things Before Breakfast: The Evolutionary Origins of Belief*, London, Faber and Faber.
Wunenburger, J.-J. [1997], *Philosophie des images*, Paris, Presses Universitaires de France.
Zvelebil, M. [1997], *Hunter-gatherer Ritual Landscape: Spatial Organisation, Social Structure and Ideology Among Hunter-gatherers of Northern Europe and Western Siberia*, «Analecta Praehistorica Leidensia» 29, pp. 33-50.