

# **Vital signs: An ecosemiotic perspective on the human ecology of Amazonia**

*Alf Hornborg*

Human Ecology Division, Lund University  
Finnegatan 16, 223 62 Lund, Sweden  
e-mail: [alf.hornborg@humecol.lu.se](mailto:alf.hornborg@humecol.lu.se)

**Abstract.** Ecosemiotics represents a theoretical approach to human ecology that can be applied across several disciplines. Its primary justification lies in the ambition to transcend “Cartesian”, conceptual dichotomies such as culture/nature, society/nature, mental/material, etc. It argues that ecosystems are constituted no less by flows of signs than by flows of matter and energy. This paper discusses the roles of different kinds of human sign systems in the ecology of Amazonia, ranging from the phenomenology of unconscious sensations, through linguistic signs such as metaphors and ethnobiological taxonomies, to money and the political economy of environmental destruction. Human-environmental relations mediated by direct, sensory and (oral) linguistic communication have tended to enhance biological diversity, suggesting modes of calibrating the long-term co-evolution of human and non-human populations. Economic sign systems, on the other hand, have rapidly and drastically transformed human-environmental relations in Amazonia to the point where the entire rainforest ecosystem is under threat. In detaching themselves from the direct, “face-to-face” communication between humans and their natural environments, flows of money and commodities — and the decontextualized knowledge systems that they engender — have no means of staying geared to the long-term negotiation of local, ecological co-existence. It is argued that the ongoing deterioration of the biosphere can be viewed as a problem of communication, deserving semiotic analysis.

## **1. Ecosemiotics: a brief theoretical background**

Human-environmental relations are being studied from a variety of perspectives in a number of disciplines. The human sciences have thus seen the emergence of new subfields such as environmental history,

environmental anthropology, environmental sociology, environmental philosophy, and environmental economics. Ecosemiotics, on the other hand, should be seen as a new theoretical approach to human ecology that can be applied across several disciplines (cf. Hornborg 1996, 1999a; Nöth 1998; Kull 1998). Its basic assumptions are of a highly abstract and formal nature, but can be used as a framework for organizing very specific, empirical material. Its primary justification lies in its ambition to transcend “Cartesian”, conceptual dichotomies such as culture/nature, society/nature, mental/material, etc. To the extent that such binary oppositions continue to obstruct holistic understandings of human agency in the biosphere, the various environmental subfields of the human sciences may have something to gain from an elementary familiarity with the ecosemiotic paradigm.

Briefly, we might characterize this paradigm as founded on the contention that ecosystems are constituted no less by flows of signs than by flows of matter and energy. It rejects the conventional notion of nature as a primarily material phenomenon, opposed to a notion of society as primarily communicative. Rather, it views nature and society as interconnected systems, both of which are simultaneously material and communicative.

When I write that ecosemiotics is a “new” theoretical approach, this needs to be qualified. Early in the twentieth century, the zoologist Jakob von Uexküll (1864–1944) had realized how constrained our view of ecosystems had become by the obsession with quantification and materiality that dominated the natural sciences. His concern was to visualize the interaction of organisms in nature as premised on their subjective, species-specific perception of each other and of their worlds. He called such subjective worlds *Umwelten* (Uexküll 1982 [1940]). This subjectivistic brand of biology laid the foundation for the modern science of ethology, but its philosophical implications for general biology and ecology should have been far-reaching. The continued hegemony of materialism in natural science can be understood as an accommodation to the demands of an economic and technological establishment concerned with the management and control of natural systems. Uexküll’s *Umweltlehre* raised more profound questions about nature than the exact measurement of its material metabolism. In echoing the animistic cosmologies of many pre-modern cultures, it has appeared romantic and of little use for the modern science of ecology. Possibly, the recent concern with biological communication (e.g., pheromones) could lead to a general reassessment of Uexküll’s position. Nevertheless, this concern remains pragmatic rather than phi-

losophical and continues to be geared to measurement and control. Whereas Uexküll and the pre-modern animists were both concerned with perceiving the natural environment as composed of sentient subjects, mainstream biology continues to convey the image of nature as an assemblage of objects.

The significance of an ecosemiotic approach becomes clearer when we consider the role of humans in ecosystems. The anthropologist, psychiatrist, and biologist Gregory Bateson (1904–1980) similarly visualized a science of living systems that focused on communication. He applied a remarkably consistent, theoretical framework to his various studies of animal behaviour (dolphins, octopuses, otters), play, alcoholism, schizophrenia, art, ritual, war, and environmental crisis. Whatever the material substrate and the particular outcome, Bateson argued that the patterns and forms of living things are generated in communicative relations between recursively engaged subjects or “minds” (Bateson 1972, 1979). He was thus able to see cultural phenomena such as language or ritual as subsets of a much wider and more general category of communicative phenomena, which defined and coincided with life itself. This largely intuitive vision surfaced in a number of startling analogies between cultural and biological phenomena that mainstream anthropology found little use for. In later years he explicitly tried to apply these insights to environmental concerns by approaching ecological crisis as a “pathology” of epistemology and communication. Such normative and functionalist arguments made him and his followers (e.g. Rappaport 1968, 1979) easy targets for criticism within anthropology (e.g. Friedman 1979), but I believe that this has been an unfortunate case of throwing the baby out with the bathwater (cf. Hornborg 1996, 1998a). As Bateson and Rappaport envisaged, we have many insights to gain from viewing ecological crisis as a problem of communication.

## **2. Questions and applications**

In what follows I shall try to address three questions that I believe to be of fundamental importance to ecosemiotics:

- (1) To what extent can ecosystems be seen as semiotic (sign-mediated) phenomena?
- (2) To what extent can those semiotic flows and processes that are organized by humans be seen as constitutive of ecosystems?

(3) What are the different kinds of human sign systems that take part in the constitution of ecological processes, and which generalizations can we make about their respective roles in transforming ecosystems?

The first of these questions challenges the conventional dichotomy of the communicative (or “mental”; cf. Bateson’s notion of “mind”) and the material. The second challenges the dichotomy of culture and nature. The third, finally, mobilizes ecosemiotic perspectives in an attempt to provide a general account of ecological crisis. It suggests, in fact, that such perspectives should be crucial ingredients in the currently ongoing, global deliberations on sustainability.

Although the issues raised are of general and global importance, I have chosen to ground this discussion in the ethnography and historical ecology of Amazonia. Amazonia not only happens to be the region of the world the ethnography of which I am most familiar with (Hornborg 1988, 1993, 1998b), it is also a bioregion conventionally perceived as pristine wilderness yet inhabited for millennia by human populations that have actively transformed it.

Add to this the increasing volume of ethnography documenting in subtle detail the indigenous cosmology and practice of human-environmental relations in the region (e.g. Århem 1996; Brown 1986; Crocker 1985; Descola 1994; Kensinger & Kracke 1981; Moran 1993; Posey & Balée 1989; Reichel-Dolmatoff 1971, 1996; Rival 1996; Roosevelt 1994a; Seeger 1981; Sponsel 1995; Viveiros de Castro 1992, 1998, 1999), and it will be apparent that Amazonia can be approached as something of an ecosemiotic laboratory. Needless to say, the format of this article permits me only to sketch the barest outline of such a comparative study, the main purpose of which is to convey the wide spectrum of possible applications of an ecosemiotic perspective. Due to the wealth of relevant material, only a minute sample of what the ethnographers of Amazonia have reported on human-environmental relations in the area can be mentioned in this context. The list of references is nevertheless oversized in proportion to the text, suggesting that this should be classified as a review article and a proposal for future work.

In posing and addressing questions such as those above, I hope that we shall be able to organize our thinking about human-environmental relations in new ways. In particular, an ecosemiotic approach may provide a conceptual framework for transcending “Cartesian” dichotomies such as mental/material or culture/nature without abandoning the analytical rigour that remains Descartes’ more essential legacy.

### 2.1. To what extent can ecosystems be seen as semiotic (sign-mediated) phenomena?

As Uexküll and Bateson have both in different ways shown, the material interactions of organisms in ecosystems presuppose their exchange and interpretation of signs. This point requires no elaborate argument, but a single example may be appropriate. The harpy eagle (*Harpia harpyja*) of the Amazon rainforest is equipped not only with a very keen sense of sight but also with a propensity to respond to those particular kinds of movement in the foliage that result from the activities of monkeys. Were it not for the eagle's capacity to interpret such very specific sense data, it would not maintain its position at the apex of the Amazonian food chain. Conversely, monkeys have responded phylogenetically by becoming increasingly attentive to signs of eagles. This can be generalized for the entire rainforest ecosystem. In a myriad similar ways, each organism and species exists by virtue of its capacity to perceive and interpret the world around it. An ecosystem is not a machine, where the various components mindlessly fulfil their functions as a reflection of the external mind of the engineer. Ecosystems are incredibly complex articulations of innumerable, sentient subjects, engaging each other through the lenses of their own subjective worlds. Intriguingly, as we shall see, such an interpretation of ecology, here offered in an academic context, harmonizes exceedingly well with traditional, indigenous "ecocosmologies" (Croll & Parkin 1992; Århem 1996, n.d.) in Amazonia. Ecosemiotics thus does not merely provide a vantage-point for understanding these cosmologies in theoretical terms, but actually also for *validating* them (cf. Hornborg 1996, 1999b).

### 2.2. To what extent can those semiotic flows and processes that are organized by humans be seen as constitutive of ecosystems?

There is a tradition in European thought of maintaining a conceptual boundary between "nature" and "culture". To be sure, the impact of human activity on the natural environment has been all too apparent throughout Western history (cf. Thomas 1956; Turner *et al.* 1990; Worster 1988; Ponting 1991; Simmons 1993b; Hughes 1994). However, rather than acknowledging the pervasive interfusion of humanity and non-human nature, European cosmology has responded either by

ignoring the anthropogenic aspects of landscapes or by reserving its notion of “nature” for distinct but dwindling, geographical areas perceived as uncontaminated by human activity (cf. Ellen 1996). This is well exemplified by a quote from Marston Bates’ *Where Winter Never Comes* that introduces a popular volume on *The Amazon* published by Time-Life Books as part of its series on *The World’s Wild Places*: “It is a humbling experience, and surely a healthy one, to enter a landscape that man has not been able to alter, to dominate, to twist to his own purposes” (Sterling 1973: 18).

In recent years, there has been a growing recognition of the need to transcend such rigid nature/culture dichotomies in our approach, for instance, to landscapes or human bodies. Both human organisms and their environments are partly biophysical and partly symbolic in derivation. Nature and culture are not mutually exclusive domains or essences, but sedimentations of semiotic processes at different levels of integration. Even biochemical processes have a semiotic dimension (Hoffmeyer 1996), not to mention the various visual, auditory, olfactory, and tactile communication systems of human and non-human organisms. It nevertheless remains justified to analytically distinguish “cultural” phenomena as those which rely on that specific category of signs that we call *symbols*, defined by Peirce as signs that relate only by convention to the objects to which they refer. Cultural or symbolic phenomena may thus qualify as more or less uniquely human, yet in this context should be recognized as recent additions to the more general semiotics of ecosystems.

We may note in passing how difficult it is to extricate ourselves from dichotomous patterns of thinking that are evoked by polarizing vocabularies such as nature/culture, material/communicative, or biophysical/symbolic. Such distinctions need not be abandoned, however, as long as we acknowledge them as referring merely to “aspects” or “dimensions” of living systems rather than to partitioned “segments” of reality. Seen as aspects of integrated wholes rather than entities in their own right, the opposite poles of such analytical dichotomies should not be treated as standing in some kind of causal relationship to each other. An analytical dualism, in other words, need not imply an ontological dualism.

Amazonia provides us with remarkable evidence for the extent to which human, cultural behaviour can be constitutive of ecosystems. I am not referring here to the widely publicized deforestation of significant parts of the region in recent decades, but to the discovery that the composition of the presumably pristine rainforests themselves has

been influenced by human activity over the centuries. It has been suggested that at least 12% of the *terra firme* forests of Brazilian Amazonia may be anthropogenic, i.e. “of a biocultural origin that would not have existed without past human interference” (Balée 1989, 1993: 231). Detailed, ethnobotanical studies of the agroforestry practices of e.g. the Kayapó (Posey 1983, 1985) and the Ka’apor (Balée 1993) of Brazil reveal that human activity has had a tendency to enhance rather than diminish biodiversity. In stark contrast to modern monocultures of, e.g., *Eucalyptus* or soybeans, indigenous agroforestry complexes tend to increase the number of species per hectare. Whether or not this is the result of conscious intention is a matter of contention (Balée 1993), with obvious implications for discussions of the nature of “traditional ecological knowledge”. yet does not really affect the general conclusion here, viz. that the cultural predilections of human beings leave their marks even in the most “natural” of environments (for a similar assessment on a global scale, cf. Simmons 1993b).

A fundamental challenge for ecosemiotics is to develop a framework for accounting for the interpenetration of “culture” and “nature”. Although there seems to be a widespread consensus that the dichotomy needs to be transcended, most contributions that make this claim can be more or less readily assigned to either of C. P. Snow’s “two cultures” (humanities versus natural science; cf. Ingerson 1994). I should add that I am here only considering those studies that engage both theory and tangible, empirical material on human-environmental relations in different cultural contexts. This generally restricts our discussion to studies from anthropology, while excluding, for instance, most work in environmental history (which tends to lack theory) or environmental philosophy (which tends to lack empirical material). On one hand, there are studies that in various ways are concerned with the human experience and perception of the environment (e.g., Croll & Parkin 1992; Simmons 1993a; Hirsch & O’Hanlon 1995; Descola & Pálsson 1996; Ellen & Fukui 1996; Ingold 2000). On the other hand, there are studies which tend to privilege quantitative data on the measurable, biophysical parameters of human-environmental relations (e.g. Moran 1990, 1993; Bates & Lees 1996; Kormondy & Brown 1998; and to some extent also Simmons 1993b; Crumley 1994; Sponsel 1995; Wilson 1999). Over the years, although several scholars have demonstrated eminent proficiency in both discourses (e.g., Rappaport 1968; Ellen 1982; Ingold 1986; Descola 1994), very rarely has there been a successful, theoretical integration of humanistic and biophysical dimensions in the study of human ecology. In the present

discussion I can only in a very rudimentary manner suggest some theoretical avenues for striking such a balance between constructivism and scientific realism. Let us begin by asking the kinds of questions that an ecosemiotic perspective would have to raise.

2.3. What are the different kinds of human sign systems that take part in the constitution of ecological processes, and which generalizations can we make about their respective roles in transforming ecosystems?

I shall distinguish between three kinds of sign systems: *sensory*, *linguistic*, and *economic*. Each of these semiotic levels is a prerequisite for the next, since linguistic signs must be mediated by sense organs and economic signs by cultural categories pertaining to exchange (e.g., “money”, “price”, “commodity”, “wage”). On the other hand, each level has had a tendency to progressively detach itself from the logically and phylogenetically prior one, disembedding discourse from experience and economy from culture.

*2.3.1. Sensory signs*

To begin with, of course, humans are equipped to transmit and receive sensory (visual, auditory, tactile, olfactory, taste) signals like other animals. Such pre- or extra-linguistic sign systems are intrinsically difficult to theorize about, primarily because theory itself is founded in language. Theory can here rarely do more than *evoke* what remains an infinitely subtle, elusive, and largely unconscious level of human experience. Yet the approach of phenomenology, with its notions of “dwelling” and “being-in-the-world”, has been quite successful in helping us acknowledge its importance. This in itself has amounted to a powerful counterpoint to materialist science and “Cartesian” objectification. Significantly, phenomenological approaches in environmental philosophy (Evernden 1985) and anthropology (Ingold 2000) tend to emphasize the fundamental, human inclination to experience the natural environment as composed of subjects (cf. also Bird-David 1993, 1999).

Throughout the millennia of foraging and subsistence horticulture in Amazonia, a major part of the interaction between human and non-human organisms has been mediated by a myriad sensations of the eye, ear, nose, tongue, and skin, only a fraction of which have been reflected upon and assigned linguistic categories. Such sensory sign



flows are what constitute the human embedment in the world evoked by phenomenologists and “practice theorists”. To the extent that people mimetically reproduce and share conventional patterns of emitting and responding to such sensory signals, these patterns are cultural. To the extent that they represent embodied, practical skills of coping in the rainforest environment, they can be classified as a non-linguistic component of “traditional ecological knowledge”. This sensory level of human-environmental relations includes modes of interpreting non-human life forms as well as modes of communicating with them. Amahuaca hunters in Peru know not only how to glean information from sounds, movements, scents, excrements, tooth marks, tracks, bits of fruit, displaced leaves, broken twigs, etc., but also how to disguise their own colour and scent and to imitate animal cries and try to get the animals to respond (Carneiro 1974: 126–127). Hunters among the Achuar of Ecuador similarly use all their senses in interpreting the characteristic signs of different species and are able to “do a perfect imitation of the distress calls of young or of a female in heat of any species to draw the parents or males within range of the blowgun” (Descola 1994: 237).

Though seemingly ephemeral and largely uncodified in language, sensory sign systems are nonetheless potent ingredients in human-environmental relations, capable of inscribing themselves in the landscape. The relation between such local, cultural experience and natural surroundings is clearly co-evolutionary, or recursive, much as any other relation in an ecosystem. Whether deliberately or not, the dietary and other cultural preferences of past generations of Amazonian Indians such as the Ka’apor have left a tangible record in the form of, e.g., old fallows, with a much higher incidence of food species (Balée 1993: 245; 1995: 106). Referring to Carole Crumley’s definition of “landscape” as “the material manifestation of the relation between humans and the environment”, Balée (1995: 106) concludes that “old fallows constitute landscapes per excellence”. The Huaorani of the Upper Marañon similarly tend to encourage the occurrence of the *ungurahua* palm (*Jessenia bataua*) and other useful species, while more consciously cultivating the peach palm (*Bactris gasipaes*) and sweet manioc (Rival 1996: 238–241). Rival shows that these species are assigned different symbolic values and associated with different kinds of social relations. The peach palms and their fruit are perceived as gifts from deceased relatives and appropriate food for celebrating within the endogamous group, while manioc is used to entertain visitors and potential allies. It is not difficult to imagine the role of such senti-

ments in generating specific patterns of distribution for different plant species. Although much of this crop symbolism is evidently codified in explicit preferences (cf. next section), it is apparent that the sentiments thus expressed represent a more elusive, sensory level of experience that is transmitted largely through mimetic practice rather than words. No less than language, social practice is a cultural process that conditions human beings to respond in specific ways to particular signs. Suffice to say that sensory, non-linguistic signs do play an important role in traditional, human-environmental relations, and that, for millennia, they have been active ingredients in the human transformation of ecosystems.

### *2.3.2. Linguistic signs*

A second kind of human sign system is, of course, language. Linguistic sign systems are generally regarded as the central medium of culture, and it is no coincidence that anthropological theories of culture to such a large extent have been inspired by linguistics.

Whether analyzing systems of ethnobiological classification (Fowler 1977; Berlin 1992) or metaphorizations of human-environmental relations (Lévi-Strauss 1969b, 1973, 1978; Gudeman 1986; Bird-David 1993; Descola 1994; Århem 1996; Viveiros de Castro 1999), anthropologists have focused on linguistic data. It would seem obvious that cultural categories and metaphors are likely to influence the way humans engage their natural surroundings, but for anthropologists of a phenomenological persuasion, such linguistic codifications are secondary to practical knowledge, or skill (cf. Ingold 1992, 2000). The relative significance of the two levels probably varies between different cultural contexts, with social complexification and modernization generally entailing increasing emphasis on language. In any case, linguistic signs have always been the main source of cultural information for anthropologists, and it is difficult to envisage a systematic research methodology for eliciting cultural information that would not have to use language as a medium.

Human language has most certainly become an active ingredient in ecosystems (cf. Rappaport 1993: 156). Balée (1995: 100–101) suggests that one of the effects of post-conquest depopulation on the Guajá Indians of Brazil was a significant reduction of plant vocabulary, and that this was associated with their abandonment of a sedentary and agricultural existence. (He nevertheless finds in the modern, impoverished Guajá language compelling evidence for prior horticultural

ture.) The number of generic plant names among the linguistically related and still agricultural Ka'apor is about 479, while in Guajá (for the same flora) "only" 353. It is evident that language may serve as a repository of ecological knowledge, if only as a mnemonic device providing cues for the activation of a much larger body of practical knowledge acquired through practice. Language can thus be seen as a codification of human practice, including practical engagement with non-human organisms. In serving as a kind of systemic memory that is indeterminately yet significantly related to systemic performance, linguistic codes are in certain respects analogous to genetic codes (Hornborg 1988). This applies not only to ethnobiological taxonomies such as those investigated by Balée, but also to the various metaphorizations of human-environmental relations that have been reported from indigenous peoples throughout Amazonia.

### *The social life of nature*

Metaphorical representations of this kind often invoke familiar aspects of social life to serve as models for human interaction with non-human nature. Descola (1992) refers to such projections of meaning from society to nature as "animism", as opposed to the inverse projection from nature to society that we know as "totemism" (cf. Lévi-Strauss 1966). Common to both is the interpenetration or perhaps amalgamation of categories and sentiments pertaining to social and human-environmental relations, respectively. Ingold (1996) argues that these two kinds of relations are not distinguishable from each other in hunting-and-gathering societies. From the perspective of an outside observer, however, it is striking how widespread is the drift of attitudes and sentiments from social to human-environmental relations in traditional societies (cf. Gudeman 1986; Bird-David 1993; Descola 1994). No doubt there is also a widespread transfer of meanings in the opposite direction, suggesting a dialectic between "animism" and "totemism".<sup>1</sup>

Among the Achuar, Descola (1994: 327) discovers that "the distinction between hunting and gardening is nurtured by an opposition

---

<sup>1</sup> Such a dialectic between images of society and images of nature can also be identified in the history of Western civilization, as is obvious, for instance, in the affinities between the ideology of capitalism and Darwinism. Other examples might include the recursive mirroring of a clock-like, rationally constructed society, on one hand, and a mechanistic view of the cosmos, on the other. Of much greater antiquity is the dialectic between kin-based or political authority and images of a patriarchal divinity.

between two types of sociability: the women's consanguine mothering of cultivated plants and the affinal charming of game practiced by the men". Skills in these activities hinge on the capacity to communicate with other life forms through magical songs called *anent*, and Descola (1994: 262) notes that hunting *anent* "have a cajoling, wheedling tone that is not found in gardening *anent*, the garden being a world of kindred beings devoid of the touchy feelings that the man must take care not to ruffle in dealing with allies". In line with what has been previously said, it is obvious that the linguistic form of these songs is merely the skeleton of a profoundly embodied mode of communication. The word *anent* literally designates "words that come from the heart" (Descola 1994: 198). "The 'sung' mode", says Descola (1994: 200), is used "to overdetermine normal language in those circumstances where the latter is not an adequate vehicle, that is when the words must reach the heart of a spatially or ontologically remote target". In the Achuar universe, humans, plants, animals, and even meteors can be seen as persons with individual souls (Descola 1994: 93), and Descola asks why, given such a universe, the Achuar should forego the normal means of acting upon it. "When one postulates that cultivated plants are beings with souls, it is obviously normal to attempt to keep up harmonious relations with them, using for this magical songs (*anent*) which are employed to the same end in human relations" (Descola 1994: 214).

It is evident that the essence of those practices that modern people refer to as "magic" or "ritual" is the imperative to communicate with non-human nature that stems logically from viewing the world as composed of sentient subjects. This attitude may be extended beyond the domain of living things on our planet, as when the Eastern Timbira of Brazil ceremonially induce the Moon (*Puduvri*) to keep the maize plants free of animal parasites (Nimuendajú 1974: 117). If astronomical bodies are capable of signalling to humans — as indeed the Pleiades (*krot*) to the Eastern Timbira signal the rainy season and the need to start clearing for a garden (*ibid.*, 116) — it is only logical that they should be involved in the total, communicative community of which the Amazonian Indian perceives himself to be a part. It should nevertheless be justified to distinguish between those human signs that actually do have a sentient, non-human receiver (e.g.; in the form of a game animal) and those that only ostensibly do so (e.g.; exhortations to astronomical bodies). This is not to say that "ostensible" communication is necessarily less efficient in producing the desired result than "actual" communication, as it may serve the important purpose of

calibrating an uncertain subject to its task. Tambiah (1968: 202) writes that it is possible to argue that “all ritual, whatever the idiom, is addressed to the human participants and uses a technique which attempts to re-structure and integrate the minds and emotions of the actors”. From the perspective of an observer, however, there is clearly a difference between actually communicating with non-human subjects, on the one hand, and individually or collectively summoning one’s own powers of concentration, on the other.

### *In the eye of the beholder*

Every Amazonian people has developed its own cultural lens for interpreting its natural environment, but there are some fundamental themes that seem to be pervasive throughout most of this vast region. Significantly for our purposes, one such theme is a keen awareness of the notion of perspective, i.e. the recognition that any particular perception of the world is contingent on the vantage-point of the beholder. In acknowledging that the relation between sign and object hinges on the interpretant, this basic wisdom reveals an indigenous, Amazonian concern with semiotics. An early observation along these lines is Weiss’ remark about the cosmology of the Campa:

It is a world of relative semblances, where different kinds of beings see the same things differently; thus human eyes can normally see good spirits only in the form of lightning flashes or birds whereas they see themselves in their true human form, and similarly in the eyes of jaguars human beings look like peccaries to be hunted. (Weiss 1974: 264)

A number of Amazonian ethnographies confirm this pervasive link between what Århem (1991) and Viveiros de Castro (1998) call “perspectivism” and an understanding of the world as a continuous food chain. To the Makuna of southeastern Colombia, for instance, any class of beings will classify all others as either “predators” or “prey”, in shamanic language referred to respectively as *yai* (jaguar) and *wai* (fish) (Århem 1996). As among traditional hunting peoples in many parts of the world, the relation between the Makuna hunter and his prey is construed as a reciprocal exchange between human and animal communities, modelled on the relation between affines. Through a continuous recycling of souls or “generic vitality”, predation — whether in the form of humans consuming animals or spirits consuming humans — is thus also procreation. This is linked to a widespread, cosmological theme that represents affinal relations and predation as cognate forms of symbolic exchange (cf. Descola 1992; Overing

1993). This theme has inspired a number of anthropological studies of what Viveiros de Castro (1996: 190) calls the “symbolic economy of alterity”, linking native Amazonian sociologies and ecologies into a common, interpretative framework for understanding as seemingly disparate, cultural phenomena as war, cannibalism, hunting, shamanism, and funerary rites (cf. Viveiros de Castro’s own 1992 study of the Brazilian Araweté).

A crucial element of such animistic cosmologies of Amazonia is the conviction that all beings are fundamentally “humans” or “persons”, as expressed, for instance, in the Makuna notion of *masa* (Århem 1996: 200). Viveiros de Castro (1999: 4) writes: “To say [...] that animals and spirits are people, is to say that they are persons, and to personify them is to attribute to non-humans the capacities of conscious intentionality and social agency which define the position of the subject”. Whereas Europeans have had a tendency to think of humans as composed of a cultural surface that disguises their animal essence, Amazonians see it the other way around: the surface appearance of animals disguises their human aspect (Viveiros de Castro 1999: 3). For Amazonian Indians, to know is to personify rather than to objectify, and an object is merely “an incompletely interpreted subject” (Viveiros de Castro 1999: 6, 8). Against this background, shamanism can be understood as the highly valued capacity of certain humans to adopt the perspective of non-human subjects (cf. Århem 1991).

Viveiros de Castro intriguingly argues that Amazonian “perspectivism” is not tantamount to relativism: all beings see the world in the same way (in terms of a single set of fundamental categories), what changes is the world that they see (Viveiros de Castro 1999: 10). Drawing on an observation by Renard-Casevitz on the Matsigenka of Peru, he suggests that words that to us denote objective, self-contained entities (such as “fish”, “snake”, “hammock”, or “beer”) tend to be used by Amazonians as “relational pointers” in the same way as kinship terms. Thus, “what to us is blood, is maize beer to the jaguar; what to us is soaking manioc, the souls of the dead see as rotting corpse; what we see as a muddy waterhole, the tapirs see as a great ceremonial house ...” (Viveiros de Castro 1999: 10; cf. Århem 1991: 119–120). In these cosmologies, it seems, to be a fish is not an intrinsic property but a condition established “only by virtue of someone else whose fish it is” (Viveiros de Castro 1999: 11). I interpret this to mean that the category “fish” should not be confused with the actual species to which humans feel that it refers, but should rather be under-

stood as an inter-specific, abstract sign for food, of which these species, from the point of view of humans, are merely an instantiation. There is an underlying unity of soul in all beings which causes them to see the same things everywhere; the difference in how they perceive other beings (as belonging to one or the other among their common set of categories) is given in the specificity of their bodies (Viveiros de Castro 1999: 13). What is remarkable about these cosmologies, from a modern vantage-point, is the extent to which Amazonians have acknowledged the limitations of their own, human powers of perception, and the empathy with which they have imagined other species' ways of viewing the world. Yet, all through this radical decentering of human experience, their basic code of linguistic categories appears never to be cast in doubt.

***Food taboos and the attempted mechanization of culture***

In considering various, linguistically mediated aspects of human-environmental relations in Amazonia, we should finally say something about dietary prohibitions or "food taboos". Twenty years ago, this topic became the focus of a more general debate which opposed "materialist" and "mentalist" interpretations of human-environmental relations in Amazonia and elsewhere. On the one hand, the approach of "cultural ecology" characteristically viewed dietary prohibitions as functional adaptations to the constraints of the natural environment, e.g. as pragmatic responses to the imperatives of resource management (Ross 1978). On the other hand, several anthropologists instead argued that the rationale for such prohibitions should be sought not in nature but in culture itself, whether approached from a symbolic, structural, or psychological perspective (Kensinger & Kracke 1981). Some of the latter emphasized, however, that there need be no real contradiction between the two approaches (e.g., Menget 1981: 6). Even the semiotician Urban (1981), who initially declares himself to be a "mentalist", concedes that "food taboos have ecological consequences, and so can be profitably analyzed within the framework of an ecosystem perspective" (Urban 1981: note 1). Tuzin (1981: 190) concluded that the issue "is not whether we see the boundary between mentalism and materialism to be friendly or hostile, but that we see the boundary at all". As long as we do, he continues, "there will be no unified theory of food taboos [...] or culture in general".

The main point of these studies seems rather to have been to show that the semiotics of food taboos are more than automatic reflections of the exigencies of the environment, and that the logic of cultural

meanings has an autonomy and a specificity that accords with a view of human populations as active and idiosyncratic subjects. Seen in this light, it is obvious that these anthropologists were provoked by the ecologists to do for human populations precisely what Uexküll and his followers have sought to do for non-human species: to grant them the status of subjects. The paradigm of “cultural ecology”, not to mention the “cultural materialism” of Harris (1979), tends to extend the denial of subjective agency from mainstream biology’s mechanistic view of ecosystems into human society and culture. An ecosemiotic perspective, on the contrary, would grant human meaning systems the same measure of idiosyncrasy as the *Umwelt* of any other species, and perceive ecosystems as the stochastic outcome of the coexistence of a multitude of such subjectivities. “Co-evolution” is clearly a better word for these processes than the cultural ecologists’ notion of “adaptation”, which conjures the image of a one-way learning process, geared to a static “environment” and leaving no room for creative, idiosyncratic innovation. Rather than amount to a distinction between the autonomous subjectivity of culture and the mechanical pragmatics of nature, humanist arguments can be accommodated within a more sensitive, communicative theory of life. As we have seen in previous sections, such a theory might well have much in common with those to which many Amazonian Indians have traditionally subscribed.

The evidence for cultural idiosyncrasy is quite obvious as far as the semiotic logic of food avoidances is concerned (cf. Leach 1964; Tambiah 1969; Sahlins 1976). Among the Shokleng of Brazil, food taboos “far transcend their purely ecological functions” by signalling social status and thus mediating social relations, a phenomenon which can be recognized as belonging to the widespread phenomenon of “totemism” (Urban 1981). From a psychoanalytic perspective, Kracke (1981) argues that food avoidances among the Kagwahiv can be understood as a symbolic language for articulating and resolving repressed, personal conflicts. The Kagwahiv “use nature as a rich source of metaphor for depicting emotional states and intimate relationships”. Kracke shows how the domestication of non-human nature with human qualities rebounds into society by offering a code with which to express social relations: “the plaintive call of the jacamin, the wail of the jogo-jogo, and the more raucous cry of the toucan are identified with a baby’s crying, while the tapir is a sexual competitor, the paca self-indulgent, and the agouti and tinamou lazy [...]”. Human qualities are thus projected onto animals prior to their serving as ordering prin-



principles for society, much as was observed above about the dialectic between “animism” and “totemism”.

Such recursive processes of meaning transfer are, of course, eminently suitable for semiotic analysis. Urban (1981: 86) observes that the purported consequences of transgressing a dietary restriction reveal “ethnotheoretic notions that can be conveyed only through language”, and that “turn out to involve an function ‘iconic’ (or what used to be called function ‘sympathetic’) connection between the species and supposed consequence”. For instance, the Shokleng claim that eating paca or agouti meat would cause the teeth of a child to grow too rapidly, causing toothache. Similarly, the Sanumá on the border between Brazil and Venezuela say that parents eating snake meat may cause their children to have diarrhea, since snakes have liquid excrement, and that eating sloth meat may cause them to develop a twisted wrist (Taylor 1981: 43–44). Kagwahiv maintain that the infant child of a man who kills a curassow (a red-beaked bird) may develop inflammations of the mouth and lips (Kracke 1981: 114). Referring to Leach (1964) and Tambiah (1969), Kracke (1981: 110) suggests that food prohibitions can be accounted for in terms of the different species’ metonymical or metaphorical proximity to humans (e.g., pets are metonymically close, while monkeys are metaphorically so). Following Lévi-Strauss (1966), Descola (1994: 211; 1992: 114) observes that some animal or plant species are particularly well suited to the role of symbolic signifier because of distinctive, visible features that suggest invisible properties. Thus, dietary prohibitions recognized by the Achuar at the time of planting their gardens function “as a sign pointing to one of the three categories of attributes detrimental to plants’ harmonious growth: things that rot, signified by the *kanka* fish, the *muntish* grub, and by digestion in general; things that burn, signified by peppers and meat exposed to direct contact with fire; things that are slender, signified by monkeys swinging on flexible branches”. (Descola 1994: 211).

Such semiotic transformations are evident not only in food prohibitions, but throughout all the various aspects of indigenous cosmology. For the Campa, whatever is “excessively thin”, has the “drab colour of decay”, or “presents a false appearance” is a demon; thus, *shiéinti* (adult ant lions), *tsiisanti* (drab-coloured hummingbirds), and *shiinti* and *tsináro* (leaf-like katydids) are all demons (Weiss 1974: 262). With regard to the last of these categories, we can observe in passing that the indigenous concern with deception — as in the widespread, mythological theme of the Trickster — is a matter deserving rigorous

semiotic analysis. Deliberate deception is obviously not the same thing as when the human essence of an animal is not apparent to the human observer, due to his or her limited powers of perception (see above), but both are profoundly semiotic concerns.

Suffice to say, at this point, that the semiotic logic underlying indigenous Amazonian sentiments regarding plant and animal species cannot be reduced to objective, utilitarian principles that somehow transcend the vagaries of sensory experience and symbolic classification. In fact, the claim of some Western observers to have access to these transcendental principles — whether “adaptation”, “optimization”, or even “sustainability” — can in itself be taken as an expression of a particular symbolic scheme (cf. Sahllins 1976; Gudeman 1986). However, to say that indigenous cosmologies are not immediately “adaptive” in a mechanical sense is not to deny that their fundamental, relational modality of human-environmental calibration, in all its attentiveness to the ecological Other, seems singularly attuned to the vital task of communication. This mode of ecological calibration, as we have seen, is founded on the continuous interweaving of direct, sensory experience and local, oral communication.

Linguistic signs, however, may also be subjected to different degrees of social reification and decontextualization. The invention of writing facilitated the detachment of words from local, socio-ecological negotiations and their use as top-down signalling systems in expansive, hierarchical social systems. Textualized knowledge systems with universalist aspirations are crucial vehicles for implementing “rational”, modernist monocultures in Amazonia as elsewhere. The fetishized vocabularies of e.g. economics and agricultural science are not designed to stay attentive to the integrity of specific, local ecosystems, but to pursue their own, abstract designs on an increasingly standardized, global landscape. This transformation in the socio-ecological use of language has been intimately geared to the logic of economic signs.

### *2.3.3. Economic signs*

A third kind of ecosemiotic flows are the movements of artefacts, people, resources, and exchange values that comprise the subject matter of economics, economic history, and economic anthropology. As we have already noted, such flows presuppose specific, cultural/linguistic understandings of exchange, including notions about reciprocity and about its appropriate, institutional frameworks. How-

ever, as investments of human labour and natural resources congeal into material exchange values, the circulation of such artefacts acquires a logic of its own that transcends the face-to-face reciprocities of oral communication and local value systems (cf. Munn 1986). Such flows have long been an influential factor in shaping human-environmental relations in Amazonia, but their ecological repercussions have recently seen a drastic increase in magnitude.

As we concluded the previous section by discussing the semiotics of food, it may be appropriate to begin by recalling, with Kelekna (1981: 178), that Lévi-Strauss (1969a) juxtaposed the exchange of “words, objects, and women” as constitutive of traditional societies, and that “food occupies an unusually prominent place in the category of ‘objects’ exchanged between individuals and groups”. Classical monographs discussing the social significance of food exchange among Amazonians include Chagnon (1968) on the Yanomamö, Rivière (1969) on the Trio, and Siskind (1973) on the Sharanahua. A corollary of what was previously said about food avoidances is that foods that are positively enjoined (and enjoyed) will also be so largely by virtue of some symbolic scheme of classification. Kelekna (1981: 184) observes that a person through the ritual consumption of a prescribed item may attempt to “appropriate the power manifested by a plant, a fish, a bird, an animal”, a phenomenon that extends even to cannibalism (Kracke 1981: 104; Viveiros de Castro 1992). Certain crops and their derivatives may also be assigned special, ritual significance, as has been the case with maize and maize beer in many areas of South America (Morris 1979).

Foodstuffs not only serve as lubricants for local, social relations, but frequently also become important items of trade. Distantly imported foodstuffs and other consumption goods have always been an important source of elite identity in stratified societies. Various geographical constellations of local, cultural demand and sources/producers/suppliers of the coveted products have generated regional systems of exchange linking various parts of Amazonia with each other and with adjoining regions such as the Andean highlands (Roth 1974 [1924/1929]; Oberem 1974 [1967]; Gade 1972; Lathrap 1973, 1974; Camino 1977; Myers 1983; Raymond 1988; Whitehead 1993, 1994; Arvelo-Jiménez & Biord 1994; Hornborg 2000). The widespread distribution of prehistoric art styles may also be indicative of long-distance exchange, e.g. of ritual paraphernalia (Lathrap 1974; Roosevelt 1994b: 6). Drawing on archaeological evidence from pre-conquest Amazonian chiefdoms, Roosevelt (1993: 260) writes that “[s]trings of

disc beads, usually of shell, were widely used as a medium of exchange, and semi-precious stone ornaments, such as greenstones [jade], were part of a system of elite gift-giving". Trade goods mentioned by Whitehead (1994: 38; 1993: 295) include worked jade from the lower Amazon exchanged for goldwork from the lower Orinoco and circum-Roraima region, poisons, metals, and jewels from the Guayana highlands, and gold objects "traded out of the Vaupés-Rio Negro region by the Manóas and circulated eastwards, as far north as the Caribbean". Even if much of the evidence for indigenous, long-distance trade derives from post-conquest historical sources, such extensive systems of exchange — and thus ultimately the global, cultural logic of consumption — have undoubtedly been important factors in determining patterns of land use in Amazonia since prehistoric times. As the archaeological evidence is generally restricted to durable trade goods such as stone, metal, and shell, it is important to remember that the greatest volumes of trade may have been in perishable, organic materials such as herbs, feathers, and animals.

Long-distance exchange in valuables may significantly affect local land use both at their source and their point of consumption by encouraging intensified production and providing catalysts for stratification (cf. Hornborg 2000). In pre-modern Amazonian societies, long assumed to have been intrinsically egalitarian (cf. Clastres 1977), it may have provided one of few possibilities for gaining political power through the control of scarce resources (alongside e.g. control of fertile river bottom lands, or of women, or sons-in-law, or ceremonial knowledge; cf. Kracke 1993). Archaeological evidence for prehistoric stratification and agricultural intensification is accumulating throughout Amazonia, with particularly striking settlement sizes and earthworks reported from Marajo Island at the mouth of the Amazon, the Santarém area on the lower Amazon, and lowland areas of Bolivia and Ecuador (Roosevelt 1993; 1994b: 8). The ridged fields and causeways of the Mojos area of Bolivia cover thousands of hectares and are clearly visible from the air. The earliest historical sources confirm high population densities, stratification, and a lively trade along the major rivers prior to European conquest (Porro 1994). Early documents emphasize the intense exploitation of floral and faunal resources and the high levels of agricultural productivity of these societies (Whitehead 1994: 36). Whitehead (*ibid.*) notes that the "fact that some Amerindian economies were geared to producing such food surpluses in antiquity is also demonstrated by the existence of indigenous markets and exchange systems in fish meal and manioc flour, as well

as the large-scale ‘ranching’ of turtles and iguanas”. He suggests, furthermore, that stratified trading polities (exemplified by the Lokono of Guayana) would have thrived as much in the interfluvial areas as in the floodplains, as such locations would have afforded control over important trade routes (Whitehead 1993: 296; 1994: 36).

In the sixteenth century, at least the main rivers of Amazonia were evidently dominated by complex, densely populated societies practicing intensive cultivation of seed crops such as maize (Roosevelt 1993). Some archaeological sites suggest populations “in the tens of thousands at least” (*ibid.*: 274). In line with a general argument that goes back to Lathrap (1968), Roosevelt (1993) suggests that the subsistence practices of most contemporary Amazonians (swidden manioc horticulture, fishing, and hunting) over much of the area represents a post-conquest regression to patterns that prevailed before the emergence of these complex polities, beginning in the first millennium B.C. This process of devolution was precipitated by the traumatic, demographic collapse that occurred some time between the mid-sixteenth and mid-seventeenth centuries as a result of the introduction of European microbes, yet largely prior to actual, European settlement (Porro 1994; Whitehead 1993: 289). These microbes rapidly diffused along the vital arteries of indigenous exchange, devastating the social fabric of Amazonia. The very existence of an established, economic communication network integrating the region was thus conducive to biological contamination, depopulation, and social crisis. There were nevertheless also indigenous groups who were able, at least temporarily, to take advantage of new opportunities for trade following the arrival of the Europeans (Whitehead 1993: 287, 297; 1994: 41).

Roosevelt’s hypothesis of a “rise and fall” of social complexity, we might add, seems compatible with the present distribution and possible, historical transformations of Amazonian kinship systems. Analyses of kin terminologies and other aspects of social cosmology suggest a certain capacity to oscillate between locally endogamous, “two-line” systems and more extrovert systems emphasizing exogamy and the distinctness — or “otherness” — of affines (Hornborg 1998b). The extent to which such a cycle may also have involved significant permutations of *ecocosmology*, and whether these are legible in the ethnoarchaeological record, is a matter about which we can only speculate (cf. Roosevelt 1994b: 16). If, as we have mentioned, notions about relations between humans and other species have been connected to notions about the relations between kin and affines, it seems probable that social transformations leading simultaneously to increas-

ing stratification and to more intensive exploitation of natural resources would have been negotiated through the medium of such a common, symbolic configuration. The key to this configuration may well be found in the pervasive, Amazonian inclination to view predatory relations as reciprocal. It would seem reasonable, given this cultural background, that increasingly exploitative relations to other species would have been legitimised through a similar imagery as was used to justify increasingly exploitative relations between affines, and that the common idiom through which these changes were enacted would have been concerned with maintaining the image of reciprocity. In pursuing this hypothesis ethnoarchaeologically, it would no doubt be useful to compare the ancient, Amazonian imagery with that of stratified, Andean polities like the Inca state (cf. Murra 1980[1956]; Godelier 1986: 160).

Largely depopulated, Amazonia in the eighteenth and nineteenth centuries reverted to the semblance of a pristine wilderness, but the growing colonial population engaged in various kinds of natural resource extraction initiated new processes of very tangible changes in land use. Whitehead (1993: 293) writes that the colonial process “has not been limited to the social sphere but also extended to the biological, directly resulting in the degradation or destruction of aboriginal flora and fauna”. Echoing Crosby’s (1986) observations on “ecological imperialism”, he mentions “the rapid way in which wild cattle, pigs, and goats may have directly degraded the grassland-savannas making them less favorable to the indigenous species” (Whitehead 1994: 37). The more recent and ongoing incorporation of Amazonia in a global market economy has accelerated environmental destruction. The local linkages between political economy and environmental destruction (such as deforestation) have been phrased in terms of “political ecology” (Painter & Durham 1995), and perspectives from “dependency theory” and “world system theory” have been applied to illuminate the global logic of unequal exchange which continues to impoverish the “extractive economies” of Amazonia (Bunker 1985; cf. Hornborg 1998c, 2001b). The rainforest ecosystem is today threatened not only by commercial forestry, ranching, and agriculture, but also by the extraction of subterranean resources such as oil (cf. Rival 1997).

From an ecosemiotic perspective, it is obvious that modern money and commodities are signs capable of radically transforming, if not dismantling, Amazonian ecosystems. I have elsewhere argued at some length that the capacity for destruction that seems to be inherent in modern, general-purpose currency is an effect of the peculiarly vacu-

ous, semiotic properties of money (Hornborg 1999a). Briefly, this semiotic vacuity consists in the undifferentiated nature of the modern, economic sign system: in contrast to genes, language, and even traditional, “multi-centric” economies, modern money represents a code “with only one sign”. It signifies everything and nothing, lacking even a conventional relation (as in Peirce’s definition of symbol) to any specific referent. I have argued (*ibid.*) that a sign system with these properties is fundamentally at odds with the principles of organization in living systems, i.e. with life itself. The reification and autonomization of exchange value has also been well accounted for in the Marxian theory of “fetishism” (Taussig 1980), which is essentially a semiotic approach to political economy (Hornborg 2001a, 2001b).

### 3. Conclusions

I have suggested that an ecosemiotic approach should lead us to ask questions about the roles of different kinds of human sign systems in transforming ecosystems. Semiotics, like any other useful methodology (e.g., logic, mathematics, neoclassical economics), always runs the risk of turning inward on itself so as to become its own, tautological obsession. When applied to the comprehension of empirical, cultural and ecological processes, however, it may help us reorganize our thinking in ways that permit new perspectives on old problems. The ongoing deterioration of the biosphere (somewhat anthropocentrically referred to as our “life support systems” or even “natural capital”) can thus be viewed as a problem of communication, deserving semiotic analysis. A semiotic approach appears to be the only conceivable framework for simultaneously considering the very diverse kinds of data on human-environmental relations that have been presented in this article, ranging from the phenomenology of unconscious sensations through structural analysis of elaborate linguistic constructions, to political economy. All these kinds of data are amenable to analysis founded on a general understanding of signs.

From this sketchy review of the human ecology of Amazonia we may draw some general conclusions about the kinds of ecological transformations that can be attributed to different kinds of human sign systems. We have seen that human-environmental relations that are primarily mediated by direct, sensory and (oral) linguistic communication, e.g., subsistence horticulture and foraging, have tended to enhance biological diversity. We have reason to believe that

hance biological diversity. We have reason to believe that ethno-biological vocabularies and metaphorical representations of human-environmental relations that are founded on intimate, practical experience of local ecosystems represent (not simple “adaptations” but) *modes of calibration* eminently suitable for negotiating the long-term co-evolution of human and non-human populations. An important ingredient in these modes of calibration is the inclination towards genuine communication with non-human interlocutors, which presupposes a dialogic stance founded on the conviction that these non-human Others are indeed sentient subjects. The effects of such communicative processes on ecosystems may indeed be transformative in the long run, but there is no evidence that they have ever threatened the integrity of Amazonian ecosystems as wholes.

Economic sign systems, on the other hand, have rapidly and drastically transformed human-environmental relations in Amazonia to the point where the entire rainforest ecosystem is under threat. Flows of reified exchange values had fundamentally transformed large areas of Amazonia already during the two millennia preceding European conquest. The devastating demographic impact of the arrival of Europeans to South America initially alleviated human designs on Amazonian ecosystems, so much so that the whole region was perceived to be virtually unaffected by human occupation. However, with the accelerating encroachment of colonialism, resource extraction and the global market economy, ecological transformations were resumed at an unprecedented rate. In detaching themselves from the direct, “face-to-face” communication between humans and their natural environments, flows of money and commodities — and the textualized knowledge systems that they engender — have no means of staying geared to the long-term negotiation of local, ecological co-existence. On the contrary, their effect seems generally — in Amazonia as elsewhere — to have been to transform human perceptions of the environment from a community of sentient subjects to a mechanical assemblage of objects, thus truncating an ancient and literally vital dialogue. This objectivist stance has also been globally codified in the form of mainstream biological and ecological science. An ecosemiotic perspective, on the contrary, would rather stay attuned to the “animistic” cosmologies of native Amazonia, for perfectly rational reasons. It seems doubtful, however, that such local sensitivity to context can be



significantly revitalized on a global scale without major transformations of the very idea of money.<sup>2</sup>

## References

- Århem, Kaj 1991. Ecosofia Makuna. In: Correa, Francois (ed.), *La selva humanizada: Ecología alternativa en el trópico húmedo colombiano*. Bogotá: ICAN/FEN/CEREC, 105–122.
- 1996. The cosmic food web: Human-nature relatedness in the Northwest Amazon. In: Descola & Pálsson (eds.) 1996, 185–204.
- (n.d.). Ecocosmology: Indigenous conceptions of human-nature relatedness. Book proposal by Kaj Århem, Göteborg university. MS, 9 pp.
- Arvelo-Jiménez, Nelly; Biord, Horacio 1994. The impact of conquest on contemporary indigenous peoples of the Guiana Shield: The System of Orinoco Regional Interdependence. In: Roosevelt (ed.) 1994a, 55–78.
- Balée, William 1989. Managed forest succession in Amazonia: The Ka'apor case. In: Posey & Balée (eds.) 1989, 129–158.
- 1993. Indigenous transformation of Amazonian forests: An example from Maranhão, Brazil. *L'Homme* 126/128: 231–254.
- 1995. Historical ecology of Amazonia. In: Sponsel (ed.) 1995, 97–110.
- Bates, Daniel G.; Lees, Susan H. (eds.) 1996. *Case Studies in Human Ecology*. New York: Plenum.
- Bateson, Gregory 1972. *Steps to an Ecology of Mind*. Frogmore: Paladin.
- 1979. *Mind and Nature: A Necessary Unity*. New York: Dutton.
- Berlin, Brent 1992. *Ethnobiological Classification: Principles of Categorization of Plants and Animals in Traditional Societies*. Princeton: Princeton University Press.
- Bird-David, Nurit 1993. Tribal metaphorization of human-nature relatedness. In: Milton, Kay (ed.), *Environmentalism: The View from Anthropology*. London: Routledge, 112–125.
- 1999. 'Animism' revisited: Personhood, environment, and relational epistemology. *Current Anthropology* 40(1): 67–91.
- Brown, Michael F. 1986. *Tsewa's Gift: Magic and Meaning in an Amazonian Society*. Washington: Smithsonian Institution Press.
- Bunker, Stephen G. 1985. *Underdeveloping the Amazon: Extraction, Unequal Exchange, and the Failure of the Modern State*. Chicago: University of Chicago Press.

---

<sup>2</sup> I would like to thank the Bank of Sweden Tercentenary Foundation for supporting the project "Native American Ecocosmologies and Environmental Ethics: Animism, Modernity, and the Cultural Phenomenology of Human-Environmental Relations", conducted in collaboration with Mikael Kurkiala.

- Camino, Alejandro 1977. Trueque, correrías e intercambios entre los Quechuas andinos y los Piro y Machiguenga de la montaña peruana. *Amazonía Peruana* 1(2): 123–140.
- Carneiro, Robert L. 1974 [1970]. Hunting and hunting magic among the Amapuaca of the Peruvian montaña. In: Lyon (ed.) 1974, 122–132.
- Chagnon, Napoleon A. 1968. *Yanomamö: The Fierce People*. New York: Holt, Rinehart & Winston.
- Clastres, Pierre 1977. *Society Against the State*. Oxford: Basil Blackwell.
- Crocker, J. Christopher 1985. *Vital Souls: Bororo Cosmology, Natural Symbolism, and Shamanism*. Tucson: University of Arizona Press.
- Croll, Elisabeth; Parkin, David (eds.) 1992. *Bush Base: Forest Farm. Culture, Environment and Development*. London: Routledge.
- Crosby, Alfred W. 1986. *Ecological Imperialism: The Biological Expansion of Europe, 900–1900*. Cambridge: Cambridge University Press.
- Crumley, Carole L. (ed.) 1994. *Historical Ecology: Cultural Knowledge and Changing Landscapes*. Santa Fe: School of American Research Press.
- Descola, Philippe 1992. Societies of nature and the nature of society. In: Kuper, Adam (ed.), *Conceptualizing Society*. London: Routledge, 107–126.
- 1994. *In the Society of Nature: A Native Ecology in Amazonia*. Cambridge: Cambridge University Press.
- Descola, Philippe; Pálsson, Gísli (eds.) 1996. *Nature and Society: Anthropological Perspectives*. London: Routledge.
- Ellen, Roy F. 1982. *Environment, Subsistence and System: The Ecology of Small-Scale Social Formations*. Cambridge: Cambridge University Press.
- 1996. The cognitive geometry of nature: A contextual approach. In: Descola & Pálsson (eds.) 1996, 103–123.
- Ellen, Roy F.; Fukui, Katsuyoshi (eds.) 1996. *Redefining Nature: Ecology, Culture and Domestication*. Oxford: Berg.
- Evernden, Neil 1985. *The Natural Alien: Humankind and Environment*. Toronto: University of Toronto Press.
- Fowler, Catherine S. 1977. Ethnoecology. In: Hardesty, Donald L. (ed.), *Ecological Anthropology*. New York: John Wiley & Sons, 215–243.
- Friedman, Jonathan 1979. Hegelian ecology: Between Rousseau and the World Spirit. In: Burnham, Philip C.; Ellen, Roy F. (eds.), *Social and Ecological Systems*. London: Academic Press, 253–270.
- Gade, Daniel W. 1972. Comercio y colonización en la zona de contacto entre la sierra y las tierras bajas del valle del Urubamba en el Perú. *XXXIX Congreso Internacional de Americanistas*, vol. 4. Lima, 207–221.
- Godelier, Maurice 1986. *The Mental and the Material*. London: Verso.
- Gudeman, Stephen 1986. *Economics as Culture: Models and Metaphors of Livelihood*. London: Routledge & Kegan Paul.
- Harris, Marvin 1979. *Cultural Materialism: The Struggle for a Science of Culture*. New York: Vintage.
- Hirsch, Eric & O'Hanlon, Michael (eds.) 1995. *The Anthropology of Landscape: Perspectives on Place and Space*. Oxford: Oxford University Press.
- Hoffmeyer, Jesper 1996. *Signs of Meaning in the Universe*. Bloomington: Indiana University Press.

- Hornborg, Alf 1988. *Dualism and Hierarchy in Lowland South America: Trajectories of Indigenous Social Organization*. Uppsala Studies in Cultural Anthropology 9. Stockholm: Almqvist & Wiksell.
- 1993. Panoan marriage sections: A comparative perspective. *Ethnology* 32: 101–108.
- 1996. Ecology as semiotics: Outlines of a contextualist paradigm for human ecology. In: Descola & Pálsson (eds.) 1996, 45–62.
- 1998a. Ecological embeddedness and personhood: Have we always been capitalists? *Anthropology Today* 14(2): 3–5. [Reprinted in Michael Lambek & Ellen Messer (eds.) 2001. *Ecology and the Sacred: Engaging the Anthropology of Roy A. Rappaport*. Ann Arbor: University of Michigan Press.]
- 1998b. Serial redundancy in Amazonian social structure: Is there a method for poststructuralist comparison? In: Godelier, Maurice; Trautmann, Thomas R.; Tjon Sie Fat, Franklin E. (eds.), *Transformations of Kinship*. Washington: Smithsonian Institution Press, 168–186.
- 1998c. Towards an ecological theory of unequal exchange: Articulating world system theory and ecological economics. *Ecological Economics* 25(1): 127–136.
- 1999a. Money and the semiotics of ecosystem dissolution. *Journal of Material Culture* 4(2): 143–162.
- 1999b. Comment on Nurit Bird-David, ‘Animism’ revisited: Personhood, environment, and relational epistemology. *Current Anthropology* 40(1): 80–81.
- 2000. Accumulation based on symbolic versus intrinsic ‘productivity’: Conceptualizing unequal exchange from *Spondylus* shells to fossil fuels. In: Denemark, Robert; Friedman, Jonathan; Gills, Barry; Modelski, George (eds.), *World System History: The Social Science of Long-Term Change*. London: Routledge, 235–252.
- 2001a. Symbolic technologies: Machines and the Marxian notion of fetishism. *Anthropological Theory* 1(4).
- 2001b. *The Power of the Machine: Global Inequalities of Economy, Technology, and Environment*. Walnut Creek: Altamira/Rowman & Littlefield.
- Hughes, J. Donald 1994. *Pan’s Travail: Environmental Problems of the Ancient Greeks and Romans*. Baltimore: John Hopkins University Press.
- Ingerson, Alice E. 1994. Tracking and testing the Nature-Culture dichotomy. In: Crumley (ed.) 1994, 43–66.
- Ingold, Tim 1986. *The Appropriation of Nature: Essays on Human Ecology and Social Relations*. Manchester: Manchester University Press.
- 1992. Culture and the perception of the environment. In: Croll & Parkin (eds.) 1992, 39–56.
- 1996. Hunting and gathering as ways of perceiving the environment. In: Ellen & Fukui (eds.) 1996, 117–155.
- 2000. *The Perception of the Environment: Essays in Livelihood, Dwelling and Skill*. London: Routledge.
- Kelekna, Pita 1981. Aчуара food taboos. In: Kensinger & Kracke (eds.) 1981, 177–185.

- Kensinger, Kenneth M.; Kracke, Waud H. (eds.) 1981. *Food Taboos in Lowland South America*. Working Papers on South American Indians 3. Bennington: Bennington College.
- Kormondy, Edward J.; Brown, Daniel E. 1998. *Fundamentals of Human Ecology*. Upper Saddle River: Prentice Hall.
- Kracke, Waud H. 1981. Don't let the piranha bite your liver: A psychoanalytic approach to Kagwahiv (Tupi) food taboos. In: Kensinger & Kracke (eds.) 1981, 91–142.
- (ed.) 1993. *Leadership in Lowland South America*. South American Indian Studies 1. Bennington: Bennington College.
- Kull, Kalevi 1998. Semiotic ecology: Different natures in the semiosphere. *Sign Systems Studies* 26: 344–371.
- Lathrap, Donald W. 1968. The 'hunting' economies of the Tropical Forest Zone of South America: An attempt at historical perspective. In: Lee, Richard B.; DeVore, Irven (eds.), *Man the Hunter*. Chicago: Aldine, 23–29.
- 1973. The antiquity and importance of long-distance trade relationships in the moist tropics of Pre-Columbian South America. *World Archaeology* 5: 170–186.
- 1974. The moist tropics, the arid lands, and the appearance of great art styles in the New World. *Special Publications of the Museum of the Texas Technological University* 7: 115–158.
- Leach, Edmund 1964. Anthropological aspects of language: Verbal categories and animal abuse. In: Lenneberg, Eric (ed.), *New Directions in the Study of Language*. Cambridge: MIT Press, 25–63.
- Lévi-Strauss, Claude 1966. *The Savage Mind*. Chicago: University of Chicago Press.
- 1969a. *The Elementary Structures of Kinship*. London: Eyre & Spottiswoode.
- 1969b. *The Raw and the Cooked*. New York: Harper & Row.
- 1973. *From Honey to Ashes*. New York: Harper & Row.
- 1978. *The Origin of Table Manners*. London: Jonathan Cape.
- Lyon, Patricia (ed.) 1974. *Native South Americans: Ethnology of the Least Known Continent*. Boston: Little, Brown.
- Menget, Patrick 1981. From forest to mouth: Reflections on the Txicão theory of substance. In: Kensinger & Kracke (eds.) 1981, 1–17.
- Moran, Emilio F. (ed.) 1990. *The Ecosystem Approach in Anthropology: From Concept to Practice*. Ann Arbor: University of Michigan Press.
- 1993. *Through Amazonian Eyes: The Human Ecology of Amazonian Populations*. Iowa City: University of Iowa Press.
- Morris, Craig 1979. Maize beer in the economics, politics and religion of the Inca Empire. In: Gastineau, Clifford F.; Darby, William J.; Turner, Thomas B. (eds.), *Fermented Food Beverages in Nutrition*. New York: Academic Press, 21–34.
- Munn, Nancy 1986. *The Fame of Gawa*. Cambridge: Cambridge University Press.
- Murra, John V. 1980 [1956]. The Economic Organization of the Inca State. Supplement 1 to *Research in Economic Anthropology*. Greenwich: JAI Press.
- Myers, Thomas 1983. Redes de intercambio tempranas en la hoya Amazónica. *Amazonía Peruana* 4(8): 61–75.

- Nimuendajú, Curt 1974 [1946]. Farming among the Eastern Timbira. In: Lyon (ed.) 1974, 111–119.
- Nöth, Winfried 1998. Ecosemiotics. *Sign Systems Studies* 26: 332–343.
- Oberem, Udo 1974 [1967]. Trade and trade goods in the Ecuadorian montaña. In: Lyon (ed.) 1974, 346–357.
- Overing, Joanna 1993. Death and the loss of civilized predation among the Piaroa of the Orinoco Basin. *L'Homme* 126/128: 191–211.
- Painter, Michael; Durham, William H. (eds.) 1995. *The Social Causes of Environmental Destruction in Latin America*. Ann Arbor: University of Michigan Press.
- Ponting, Clive 1991. *A Green History of the World: The Environment and the Collapse of Great Civilizations*. Harmondsworth: Penguin.
- Porro, Antonio 1994. Social organization and political power in the Amazon floodplain: The ethnohistorical sources. In: Roosevelt (ed.) 1994a, 79–94.
- Posey, Darrell Addison 1983. Indigenous ecological knowledge and development of the Amazon. In: Moran, Emilio F. (ed.), *The Dilemma of Amazonian Development*. Boulder: Westview, 135–144.
- 1985. Indigenous management of tropical forest ecosystems: The case of the Kayapó Indians of the Brazilian Amazon. *Agroforestry Systems* 3(2): 139–158.
- Posey, Darrell Addison; Balée, William (eds.) 1989. *Resource Management in Amazonia: Indigenous and Folk Strategies*. (=Advances in Economic Botany 7). Bronx: New York Botanical Garden.
- Rappaport, Roy A. 1968. *Pigs for the Ancestors: Ritual in the Ecology of a New Guinea People*. New Haven: Yale University Press.
- 1979. *Ecology, Meaning, and Religion*. Berkeley: North Atlantic Books.
- 1993. Humanity's evolution and anthropology's future. In: Borofsky, Robert (ed.), *Assessing Cultural Anthropology*. New York: McGraw-Hill, 153–166.
- Raymond, J. Scott 1988. A view from the tropical forest. In: Keatinge, Richard W. (ed.), *Peruvian Prehistory: An Overview of Pre-Inca and Inca Society*. Cambridge University Press, 279–300.
- Reichel-Dolmatoff, Gerardo 1971. *Amazonian Cosmos: The Sexual and Religious Symbolism of the Tukano Indians*. Chicago: University of Chicago Press.
- 1996. *The Forest Within: The World-View of the Tukano Amazonian Indians*. London: Themis.
- Rival, Laura 1996. Domestication as a historical and symbolic process: Wild gardens and cultivated forests in the Ecuadorian Amazon. In: Balée, William (ed.), *Advances in Historical Ecology*. New York: Columbia University Press, 232–250.
- 1997. Oil and sustainable development in the Latin American humid tropics. *Anthropology Today* 13(6): 1–3.
- Rivière, Peter G. 1969. *Marriage Among the Trio: A Principle of Social Organization*. Oxford: Oxford University Press.
- Roosevelt, Anna Curtenius 1993. The rise and fall of the Amazon chiefdoms. *L'Homme* 126/128: 255–282.
- (ed.) 1994a. *Amazonian Indians from Prehistory to the Present: Anthropological Perspectives*. Tucson: University of Arizona Press.

- 1994b. Amazonian anthropology: Strategy for a new synthesis. In: Roosevelt (ed.) 1994a, 1–29.
- Ross, Eric B. 1978. Food taboos, diet and hunting strategy: The adaptation to animals in Amazon cultural ecology. *Current Anthropology* 19(1): 1–36.
- Roth, Walter Edmund 1974 [1924/1929]. Trade and barter among the Guiana Indians. In: Lyon 1974, 159–165.
- Sahlins, Marshall 1976. *Culture and Practical Reason*. Chicago: University of Chicago Press.
- Seeger, Anthony 1981. *Nature and Society in Central Brazil*. Cambridge: Harvard University Press.
- Simmons, Ian G. 1993a. *Interpreting Nature: Cultural Constructions of the Environment*. London: Routledge.
- 1993b. *Environmental History: A Concise Introduction*. Oxford: Blackwell.
- Siskind, Janet 1973. *To Hunt in the Morning*. Oxford: Oxford University Press.
- Sponsel, Leslie E. (ed.) 1995. *Indigenous Peoples and the Future of Amazonia: An Ecological Anthropology of an Endangered World*. Tucson: University of Arizona Press.
- Sterling, Tom 1973. *The Amazon*. Amsterdam: Time-Life International.
- Tambiah, Stanley 1968. The magical power of the word. *Man* (n.s.) 3: 175–208.
- 1969. Animals are good to think and good to prohibit. *Ethnology* 8: 423–459.
- Taussig, Michael T. 1980. *The Devil and Commodity Fetishism in South America*. Chapel Hill: University of North Carolina Press.
- Taylor, Kenneth I. 1981. Knowledge and praxis in Sanumá food prohibitions. In: Kensinger & Kracke (eds.) 1981, 24–54.
- Thomas, William L., Jr. (ed.) 1956. *Man's Role in Changing the Face of the Earth*. Chicago: University of Chicago Press.
- Turner II, B. L., et al. (eds.) 1990. *The Earth as Transformed by Human Action: Global and Regional Changes in the Biosphere over the Past 300 Years*. Cambridge: Cambridge University Press.
- Tuzin, Donald F. 1981. Food taboos in lowland South America: A discussion. In: Kensinger & Kracke (eds.) 1981, 186–191.
- Uexküll, Jakob von 1982 [1940]. The theory of meaning. *Semiotica* 42: 25–82.
- Urban, Greg 1981. The semiotics of tabooed food: Shokleng (Gé). In: Kensinger & Kracke (eds.) 1981, 76–90.
- Viveiros de Castro, Eduardo 1992. *From the Enemy's Point of View: Humanity and Divinity in an Amazonian Society*. Chicago: University of Chicago Press.
- 1996. Images of nature and society in Amazonian ethnology. *Annual Review of Anthropology* 25: 179–200.
- 1998. Cosmological deixis and Amerindian perspectivism. *The Journal of the Royal Anthropological Institute* (n.s.) 4(3): 469–488.
- 1999. The transformation of objects into subjects in Amerindian ontologies. Paper presented at the 98th annual meeting of the American Anthropological Association, Chicago.
- Weiss, Gerald 1974 [1972]. Campa cosmology. In: Lyon (ed.) 1974, 251–266.
- Whitehead, Neil Lancelot 1993. Ethnic transformation and historical discontinuity in native Amazonia and Guayana, 1500–1900. *L'Homme* 126/128: 285–304.

- 1994. The ancient Amerindian polities of the Amazon, the Orinoco, and the Atlantic coast: A preliminary analysis of their passage from antiquity to extinction. In: Roosevelt (ed.) 1994a, 33–53.
- Wilson, David J. 1999. *Indigenous South Americans of the Past and Present: An Ecological Perspective*. Boulder: Westview.
- Worster, Donald (ed.) 1988. *The Ends of the Earth: Perspectives on Modern Environmental History*. Cambridge: Cambridge University Press.

### **Знаки жизни: экология человека Амазонки в экосемиотической перспективе**

Экосемиотика представляет собой теоретический подход к экологии человека, применяемый во многих дисциплинах. Ее главное оправдание заключается в стремлении преодолеть картезианские концептуальные дихотомии типа культура/природа, общество/природа, духовное/материальное и т.п. Экосемиотика утверждает, что экосистемы состоят из знаковых потоков не менее, чем из потоков материи и энергии. В статье рассматривается роль различных человеческих знаковых систем в экологии Амазонки, начиная с феноменологии подсознательных ощущений, лингвистических знаков типа метафор и этнобиологических таксономий и кончая деньгами и политэкономией разрушения окружающей среды. Отношения человека с окружающей средой, проявляющиеся в прямой, сенсорной и (устной) языковой коммуникации, приводят к увеличению биологического разнообразия, предлагая способы проверки долгосрочной коэволюции человека с остальной природой. С другой стороны, экономические знаковые системы стремительно и весьма существенно трансформировали отношения между человеком и окружающей средой в районе Амазонки, приведя их к тому, что под угрозой уничтожения оказалась вся экосистема дождевых лесов. Будучи отстраненными от прямого общения “лицом к лицу” между людьми и их средой, потоки денег и товаров — и созданные ими деконтекстуализированные системы знания — неспособны удержаться в состоянии долгосрочного посредничества в локальном экологическом сосуществовании. В статье утверждается, что продолжающуюся порчу биосферы можно рассматривать как проблему коммуникации, достойную семиотического анализа.

## **Elu märgid: Amasoonia inimökoloogia ökosemiootilises perspektiivis**

Ökosemiootika kujutab endast teoreetilist lähenemist inimökoloogiale, mida võib rakendada mitmetes distsipliinides. Selle peamine õigustus peitub soovis ületada kartesiaanlikud kontseptuaalsed dihhotoomiad nagu kultuur/loodus, ühiskond/loodus, vaimne/materiaalne jne. Ökosemiootika väidab, et ökosüsteemid ei koosne mitte vähem märgi- kui materia- ja energiavoogudest. Artiklis käsitletakse eri liiki inimmärgisüsteemide rolli Amasoonia ökoloogias, alates alateadlike tajude fenomenoloogiast, lingvistilistest märkidest nagu metafoorid ja etnobioloogilised taksonoomiad, ning lõpetades raha ja keskkonna hävitamise poliitökonoomiaga. Inimese–keskkonna suhtlemine otse, sensoorselt ja lingvistiliselt (suuliselt) on kaldunud suurendama bioloogilist mitmekesisust, soodustades arvestamist pikaajalise inimese ja ülejäänud looduse koevolutsooniga. Teisest küljest on majanduslikud märgisüsteemid kiiresti ja drastiliselt viinud inimese–keskkonna suhted Amasoonias punktini, kus hävimisohus on kogu vihmametsa ökosüsteem. Distantseerudes otsesest “näost-näku” suhtlusest inimeste ja nende keskkonna vahel, ei oma kaupade ja raha vood — ning nende tekitatud dekontekstualiseeritud teadmissüsteemid — vahendeid püsivaks pikaajaliste “läbirääkimistega” saavutatavas kohalikus, ökoloogilises koosluses. Artiklis väidetakse, et biosfääri jätkuvat rikkumist võib vaadelda kui kommunikatsiooniprobleemi, mis väärrib semiootilist analüüsi.