



# Signs of Life and Death: The Semiotic Self-Destruction of the Biosphere

Alf Hornborg<sup>1</sup> 

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## Abstract

This article applies some conceptual tools from semiotics to better understand the disastrous impacts of the world economy on global ecology. It traces the accelerating production of material disorder and waste to the logic of the money sign, as economic production processes simultaneously increase exchange-values and entropy. The exchange of indexical and iconic signs is essential to the dynamics of ecological systems and the proliferation of biological diversity. The human species has added a third kind of sign, the symbol, and more recently a fourth: all-purpose money. Money does not refer to any referent either through contiguity, similarity, or convention. It is an empty sign, capable of assuming any significance that its owner attributes to it. The article argues that the concept of symbolic reference should be restricted to cultural and linguistic phenomena. Money qualifies as a new species of sign based on its exceedingly open mode of reference. It does not refer to any object by social convention but owes its specific properties precisely to the absence of such conventions. The logic of money pivots on decontextualisation: it presupposes and encourages the detachment of exchange values, people, and concepts from the particular and the local. Selective advantage is no longer primarily about calibration within local contexts, but increasingly a matter of transcending or emancipating oneself from the specific. This drift toward decontextualisation reverses the evolution of complexity and diversity throughout the planetary biosphere.

**Keywords** Money · Entropy · Symbolic reference · Decontextualisation · Selection · Diversity

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✉ Alf Hornborg  
alf.hornborg@hek.lu.se

<sup>1</sup> Human Ecology Division, Lund University, Lund, Sweden

## Introduction

My aim in this article is to apply some conceptual tools from semiotics to better understand the disastrous impacts of the world economy on global ecology. The effort is based on the general conviction, shared by the fields of bio- and ecosemiotics (Hoffmeyer, 2005; Emmeche et al., 2002; Maran & Kull, 2014; Maran, 2020), that living systems are no less constituted by flows of signs and meanings than by flows of matter and energy. The article seeks a balance between idealism and materialism by demonstrating that the metabolisms of organisms, ecosystems, and social systems are contingent on the exchange of signs, and vice versa. Although a semiotic perspective suggests an inherently subjectivistic bias, it refuses to privilege either the communicative or the objective, material aspects of living systems. It is thus emphatically anti-dualist (Hornborg, 1996), while acknowledging analytical distinctions between matter and meaning. In emphasising the evolutionary emergence of what Jesper Hoffmeyer has called 'semiotic freedom' (Hoffmeyer, 2005: 222, 434), it serves to resist all kinds of determinism.

In linking the operational logic of signs to metabolic processes, we shall refer to an elementary typology of signs and their evolutionary progression. We shall discuss the specificity of human sign systems and their capacity to transform the socioecological systems in which they participate. This necessarily means considering the phenomenon of what Karl Marx called 'money fetishism' from a semiotic perspective. In tracing the accelerating production of material disorder (waste) to the logic of the money sign, we can examine the semiotic basis of ecological crisis. Given its crucial role in reducing both biological and cultural diversity, I conclude that all-purpose money is a strangely undertheorised biosemiotic phenomenon.

I shall begin with a review of some basic conditions and a general outline of the argument. Like biomass at any scale, from the organism to the biosphere, what I have called the 'technomass' (Hornborg, 2001a) of human society must comply with the Law of Entropy. It must ingest greater quantities of high-order matter-energy than it discharges – and subsist on dissipating the difference. The global technomass continuously produces vast and increasing volumes of disorder, to the detriment of the atmosphere, the oceans, and the diversity of non-human life. Unlike the metabolic processes of organisms, the disorder generated by the technomass degrades the conditions for life and reduces biodiversity. In order to grasp these destructive trajectories, we must reconsider the semiotic agency of the human species. Since the dawn of life, the exchange of indexical and iconic signs has been essential to the dynamics of ecological systems and the proliferation of biological diversity. A mere 200,000 years ago, the human species added a third kind of sign, classified by Charles Sanders Peirce as the symbol. For most of human existence, symbolism has been an asset for our species, promoting its capacity to adapt to a variety of habitats around the planet. Around five thousand years ago, however, the human capacity for symbolism yielded a fourth kind of sign, which is neither index, icon, nor symbol: that is, *money*. All-purpose money does not refer to any referent either through contiguity, similarity, or convention. It is an empty sign, capable of assuming any significance that its owner attributes to it. Its semiotic properties are unique – and uniquely destructive. No other species in the history of life on Earth has developed a sign system remotely similar

to it. But to understand how this new kind of sign emerged, we must first provide a general semiotic background.

### Signs, Materiality, and Metabolism in Biological and Ecological Systems

Bio- and ecosemiotics are fields concerned with the flows of signs in living systems. There is widespread agreement that signs occur only in living systems, which means that Peirce's famous suggestion that "the universe may be composed exclusively of signs" was exaggerated (Sebeok, 1994: 14). Deliberations on the operation and properties of signs can be traced back to the identification of medical symptoms in ancient Greece. Distinctions between 'natural' signs and communicative signs (most centrally words) go back at least to St. Augustine around AD 400. Over the centuries, it was acknowledged that words tend to be arbitrary signs whose meanings derive from conventions. Focusing on linguistic signs, Ferdinand de Saussure proposed that all signifiers have arbitrary relations to their signifieds. Peirce established a general typology of signs on the basis of how a signifier relates to its signified, whether through contiguity (index), similarity (icon), or convention (symbol).<sup>1</sup> Whereas linguistic signs are generally symbolic and arbitrary, indexical and iconic signs occur throughout all living systems. Peirce's framework thus extends beyond human language to all communicative processes. Although unaware of Peirce's work, Jakob von Uexküll developed a semiotic approach to ecology, realising that the interaction of organisms in an ecosystem is contingent on their subjective perceptions of their environments (Uexküll, [1940] 1982). Uexküll called an organism's subjective world its *Umwelt*. Jesper Hoffmeyer applied Peirce's semiotic framework to biological processes even at the level of cells and genes (Hoffmeyer, 2005). Whether concerned with linguistic, ecological, or biochemical processes, all these contributions refer to communicative relations in living systems. As Sebeok reminds us, "[i]t is important to realize that only living things and their inanimate extensions undergo semiosis, which thereby becomes uplifted as a necessary, if not sufficient, criterial attribute of life" (Sebeok, 1994: 6).

When it comes to questions of phylogeny, I have always contended that the emergence of life on earth, some 3.5 billions of years ago, was tantamount to the advent of semiosis. The life science and the sign science thus mutually imply one another. (Sebeok, 1994: 114)

The identification of semiotic phenomena with animateness – and the concomitant distinction between living and non-living matter – is crucial. The neglect of this distinction explains some of the confusing assertions of so-called Actor-Network Theory (ANT) (Latour, 2005). Bruno Latour has blurred the boundary between living and non-living 'actants' by equating signification with agency:

<sup>1</sup> Sebeok (1994) discusses signal, symptom, and name as three additional 'species of signs,' but these signs can variously be analysed as based on indexical, iconic, or symbolic modes of reference (cf. Bennett, 2021: 195–199).

Signification is a property of all agents, in that they never cease to have agency; this is equally true of [Tolstoy's Marshal] Kutuzov, the Mississippi, the CRF [corticotropin releasing factor] receptor, and the gravity through which bodies 'comprehend' and mutually 'influence' one another. [...] In other words, existence and signification are synonyms. *As long as they are acting, agents signify.* (Latour, 2017: 69–70, emphasis in original)

What Latour is really saying is the converse: 'As long as they are signifying, they are agents.' This is a distortion of semiotics, suggesting that to signify is to act and that every conceivable entity in the universe – living or non-living – thus can have agency simply by existing. But the hydrological inertia of the Mississippi and the gravity of astronomical bodies are not examples of agency comparable to the purposive activities of living beings, because such physical forces are simply properties of inanimate matter. In contrast to the notion of agency promoted by ANT, semioticians following Hoffmeyer have defined agency as "the ability of an organism to act in order to fulfill needs" (Emmeche et al., 2002: 26). Unlike rivers, planets, volcanoes, or hurricanes, organisms have purposes honed by natural selection, and natural selection presupposes a genetic code to work on. For Hoffmeyer, genetic codes, nervous systems, and consciousness are representations and part of the 'code duality' of living systems (Hoffmeyer, 1996). In cybernetic approaches to cognition, too, the recursive relation between inner representation and external environment defines the 'autopoiesis' or self-organisation of living systems (Maturana & Varela, 1987). Eduardo Kohn criticises Latour and other posthumanists for not acknowledging the difference between 'selves and objects,' observing that only the former use signs to "represent the world in some way or another" (Kohn, 2013: 7, 9). Similarly, in response to Stanley Salthe's suggestion that even tornadoes involve rudimentary semiosis, Hoffmeyer objects that they do not exhibit "the kind of digital analog translational dynamics which characterize all kinds of life" (Hoffmeyer, 1998: 465–466).

This is not to deny that it is difficult to identify the exact threshold between animate and inanimate. Like Hoffmeyer, Sebeok asserts that "[s]igns, inclusive of indexes, occur at their most primitive on the single-cell level, as physical or chemical entities..." (Sebeok, 1994: 68–69). At the level of organisms, semiosis is indistinguishable from perception. What happens when an organism perceives some feature of its environment is usefully expressed by Gregory Bateson in terms of "a difference that makes a difference [to somebody]" (Bateson, 1972: 423–440). The term information should be reserved for the relation between a perceiving subject and whatever it perceives. It is not a quantity that is located in the objective world (Gare, 2020, 2021). A contrast or 'difference' in the environment is requisite to perception. The occurrence of such differences (Claude Shannon's contested concept of 'information') is inversely related to entropy. According to semioticians, it is only when a contrast or difference in the environment is interpreted by the organism as signifying something, perhaps prompting a response, that it becomes information. As Hoffmeyer suggests, "[a] sign is not the same thing as a piece of information, but [...] only becomes 'information' through an act of interpretation" (Hoffmeyer, 2005:421).

In biology [...] information is not the kind of non-contextual concept it is in information theory. Biology mostly operates on an instructionist conception of information, and in the end this conception makes the transport metaphor of information – the flow or passing of information – quite illegitimate. (Hoffmeyer 2005: 428)

The perceived ‘difference’ in an organism’s environment can derive from three distinct sources: the inanimate environment; some inadvertent signs of another organism; or purposeful communication between organisms (cf. Sebeok, 1994: 78–79). All three kinds of semiosis presuppose an interpreting subject, but only the last requires two interacting subjects deliberately exchanging signs. The question is at which point it is reasonable to assert that biochemical processes at the cellular level are examples of semiosis, that is, involve an interpretant.

Hoffmeyer’s efforts to reveal semiotic processes at the biochemical level raise questions about the applicability of Peirce’s triadic model (sign – object – interpretant) to the interaction of molecules (Hoffmeyer, 1996, 1998). In his pursuit of connections between the objective and the subjective aspects of existence, Hoffmeyer has explored the boundary zone between molecular processes and sentience. He argues that “[b]io-molecules are (nearly) always carriers of signs [...] and their function in the organism cannot be understood simply through an analysis of their chemistry” (Hoffmeyer, 2005: 421). In explaining and applying Bateson’s distinction between analogic and digital coding, Hoffmeyer asserts that genetic codes are based on symbolic signs: “Digital codes are [...] necessarily based on symbolic signs (in the Peircean sign taxonomy), whereas analogic codes are based on icons and/or indexes” (Hoffmeyer, 2005: 102, my translation). Observing that genetic codes are digital, he proposes that the molecular processes through which DNA is replicated involve symbolic reference:

[The] invention of symbolic reference is in no way uniquely human. The potential of symbolic reference has been exploited by the life process as long as it has been based on the replicative sign systems of DNA and RNA molecules. (Hoffmeyer, 2005: 332–333, my translation)

As we shall see in the next section, this is difficult to reconcile with Hoffmeyer’s own concessions about the uniquely human capacity for symbolic reference and with the predominant anthropological definition of symbolism. To alleviate the contradiction, Hoffmeyer distinguishes between ‘endosomatic’ and ‘exosomatic’ symbolic reference (Hoffmeyer, 2005: 333), but the very idea of endosomatic symbolism, to most anthropologists and the human sciences in general, remains a contradiction in terms. He argues that the semiotic process in which a gene participates is “neither based on similarity nor on immediate physical causality, but on a conventional (or historically appearing), regular connection...” (Hoffmeyer, 2005: 333, my translation). In excluding two of Peirce’s three modes of reference, Hoffmeyer is compelled to conclude that genetic replication is based on symbols. As this conclusion seems incompatible with Peirce’s own conception of the symbol, the impasse can only be resolved by reconsidering either the premise that genetic replication is an instance of

semiosis, the denial that it is based on indexical or iconic reference, or the assumption that there are only these three semiotic alternatives. I leave it to others to deliberate on which of these options is most robust.

The pairing of molecules in DNA is indeed at the very threshold between inert and animate matter, but even if it is to be understood as a rudimentary form of semiosis, it cannot serve as an example of symbolic reference. While convincingly demonstrating how semiosis can emerge from inert matter, Hoffmeyer's contribution should be understood as illuminating the transition to life and sentience rather than imputing embryonically sentient properties to molecules. To trace continuities between non-living and living matter is not tantamount to demonstrating that features of the latter are immanent in the former.

### Typology of Signs and the Issue of Evolutionary Progression

Although qualified by Sebeok, Peirce has asserted that a sign "is either an *icon*, an *index*, or a *symbol*" (Peirce quoted in Sebeok, 1994: 68). It is widely held that indexical and iconic signs are logically and chronologically antecedent to symbols, and many scholars in the humanities are convinced that only humans regularly use symbols, most prominently illustrated by language. Hoffmeyer observes that "simple iconic and indexical forms of semiosis are widespread in nature, whereas symbolic reference is a much more restricted kind of semiosis which may perhaps be the privilege of a few big brained animals" (Hoffmeyer, 2005: 424). At one point he suggests that the capacity for symbolic reference is unique to humans, and he appears to agree with Terrence Deacon that, under natural conditions, only humans are able to communicate by means of symbols (Hoffmeyer, 2005: 20, 329). Deacon has proposed that the emergence of the capacity for symbolism and language can be traced in the evolution of the human brain, as evident in the fossil record (Deacon, 1997). Although he does not equate symbolism and language, Sebeok similarly concludes that the growth of brain volume in early hominids reflects the expansion of linguistic competence (Sebeok, 1994: 124). Drawing on Peirce, Deacon further argues that the relationship between the different kinds of signs (that is, modes of reference) is hierarchical, so that "indexical reference depends upon iconic reference, and symbolic reference depends upon indexical reference" (Deacon, 1997: 74). He asserts that "[s]ymbolic relationships are composed of indexical relationships between sets of indices and indexical relationships are composed of iconic relationships between sets of icons" (Deacon, 1997: 75).

It is feasible, however, to think of the three kinds of signs in a less complex way. If indexical signs relate to their referents through contiguity or direct connection, examples should include the scent, sounds, or tracks of an animal as well as the aroma or flavour of a plant. It is difficult to see why such indexical signification, which must have been elementary foundations of ecological relations since the dawn of life, should require "iconic relationships between sets of icons." If iconic signs relate to their referents through similarity, ecologically relevant examples should include the camouflage patterning of various species, selected for as a means of *avoiding* signification/perception by predators, as well as mimicry, which may deter potential predators by falsely signifying disagreeable properties that the organism does not possess.

The most controversial of the three modes of reference is the symbol. Deacon suggests that in order for symbolic reference to be possible, indexical associations between signs and referents must be abandoned in favour of associations between the signs themselves, which is the essence of language and cultural imagination (Deacon, 1997: 69–101). While anthropologists following White (1940) hold that symbols are peculiar to humans, Sebeok asserts that none of the three kinds of signs is “critical of, or unique to, humans” (Sebeok, 1994: 20). He proposes, for instance, that when honey-bees conduct their ‘dancing’ movements (to communicate the location of a food source) on a vertical surface, as opposed to a horizontal, the signification is symbolic rather than indexical (Sebeok, 1994: 33). Citing Francois Jacob, Sebeok asserts that the capacity of organisms to form symbolic concepts “obtains far down in phylogenesis,” and declares that “animals undoubtedly do have symbols” (Sebeok, 1994: 36). However, none of the examples provided by Jacob or Sebeok illustrate symbolism in the anthropological sense. Jacob notes that “[e]ven a rodent can learn to distinguish a triangle from a square or a circle and to associate shape with its quest for food” (Jacob, 1974: 319), but such learning merely illustrates what B.F. Skinner called ‘operant conditioning,’ the capacity to indexically associate a geometrical shape with food. Indeed, Sebeok in passing suggests that the ‘conditioned reflex’ of a Pavlovian dog associating the sound of a metronome with food qualifies as an “arbitrarily paired symbol” (Sebeok, 1994: 121). Sebeok’s other examples include arbitrary ‘tail work’ in dogs, cats, horses, and primates as well as the arbitrary nature of a gift offered by certain male insects to females prior to copulation (Sebeok, 1994: 36). Again, the arbitrary relationship between signifier and signifieds does not suffice to identify symbolism, as neither mammalian tail posture nor insect mating behaviour are signs arrived at through social agreement.

The disagreements concerning the occurrence of symbolism thus appear to derive from the ambiguous ways in which it is defined. On the one hand, following Saussure, the symbol is often defined in terms of an ‘arbitrary’ relationship between sign and referent. On the other, the criterion provided by Peirce is that the relationship is exclusively ‘conventional’. While seemingly equivalent, as both can be opposed to modes of reference based on contiguity or similarity, the two criteria are not completely congruent. It is possible to argue, for instance, that a particular signifier relates to its signified neither through contiguity nor similarity, although its use cannot be said to derive from a convention. The ambiguous relation between the two ways of defining symbols is illustrated by Hoffmeyer’s claim that the coupling of molecules in DNA is “arbitrary or based on a historically established ‘convention’” (Hoffmeyer, 2005: 106, n 63, my translation). A digital code, he writes, is based “in part on discontinuities between its constituent signs, in part on an arbitrary (conventional, generally historical or customary) relation between the sign and the signified” (Hoffmeyer, 2005: 110, my translation). A convention is understood by anthropologists as a cultural phenomenon based on social custom or agreement. The essence of symbolic codes such as languages is that they are socially negotiated. When ‘convention’ is more loosely defined as habitual behaviour or even biochemical regularities, regardless of whether the regularity or habit has been formed through social agreement, many kinds of repetitive animal behaviour and even biochemical processes could be classified as symbolic. We have seen how this has led Sebeok to propose that insects



are capable of symbolic behaviour. Sebeok's application of Peirce's framework is not entirely consistent, however: at one point, he reminds us that a symbol, in Peirce's view, rests on "intellectual operations" (Sebeok, 1994: 65). Neither Hoffmeyer's identification of symbolic signs in DNA molecules nor Sebeok's claim that insects use symbols thus seems compatible with Peirce's original conception. Followers of Hoffmeyer have defined 'symbol' as "a sign that refers to its object by virtue of a general (rule- or law-based) habit, or by virtue of a convention" (Emmeche et al., 2002: 30), but if 'habit' can mean any regular or repetitive juxtaposition of two physical, chemical, or biological elements, the momentous significance of symbolic reference – as elaborated, for instance, by Deacon (1997) – is completely lost.

### The Emergence of Imagination and the Semiotics of Money

To be compatible with Peirce's original definition and with general usage of the term 'symbol' in the humanities - as a sign whose meaning is based on social agreement - the concept of symbolic reference should be restricted to cultural and linguistic phenomena. To concede that the symbol is a 'higher' and more complex mode of reference than the index and icon is difficult to reconcile with the claim that it occurs among insects and molecules. To the extent that Sebeok and Hoffmeyer have identified sign processes among insects or molecules that cannot be classified as involving indexical or iconic reference, it would seem more productive to propose additional categories of signs than to adopt the concept of symbol and give it a new and controversial definition. As Deacon has observed, symbolic reference has immeasurably widened the scope for semiotic creativity. In making it possible for humans to create representations that have no empirical referents, it is the foundation for language, abstract thought, and fantasy (Hoffmeyer, 2005: 335). These recent additions to the global 'semiosphere' (Hoffmeyer, 1996) have had tremendous repercussions for all life on Earth. Culture has emerged out of nature (the biosphere) through transformations in its modes of semiosis.

The most convulsive product of the human imagination is undoubtedly money. Yet, although a very peculiar kind of sign with cataclysmic global consequences, money is rarely recognised as a semiotic phenomenon. There is, for instance, hardly a mention of money in Sebeok's classic introduction to semiotics (Sebeok, 1994) or in Hoffmeyer's wide-ranging deliberations on the role of signs in living systems (Hoffmeyer, 1996). Given the current predicament of the Earth System, we urgently need to shift our perspective on money and recognise it as a species of sign over which its human creators have lost control, and the destructive semiotic logic of which is permeating the entire biosphere.

As semioticians generally recognise, the evolution of life has generated a hierarchy of increasingly complex modes of reference currently culminating in symbolism and language. If Sebeok's and Hoffmeyer's discoveries of arbitrary sign use at the 'lower' end of this semiotic hierarchy might suggest adding a category or two to Peirce's typology, modern money qualifies as a new and unique form of sign at the opposite end. As market transactions momentarily involve the reference of money to commodities, money is obviously a sign, but it does not fit into any of the three categories established by Peirce, as it does not refer to a specific commodity either



through contiguity, similarity, or convention (Hornborg, 1999, 2016: 39). The essential property of all-purpose money is its capacity to adopt almost any meaning that its owner attributes to it. In this sense, it is a sign devoid of a referent. Yet, it is perceived as pure value and universally coveted. The perception of money tokens as embodiments of supreme value is a cultural and thus semiotic phenomenon. Karl Marx recognised the infatuation with money as a form of *fetishism*.

Fetishism is a pervasive tendency among human societies to transform symbols or other representations into indexes. Signs that symbolise social relations or transcendental ideas tend to become identified with those relations and ideas. Fetishism is thus a devolution of non-indexical into indexical reference. The paradigmatic example of a fetish is an amulet or idol representing a metaphysical being but being perceived as its material manifestation. In the same vein, an artifact that symbolises a social relation, such as a gift or an obligation to reciprocate a service, tends to be identified with that relation. Although we may well know that a money token such as a paper bill is just a piece of paper that only *represents* economic value, that piece of paper *is* simultaneously the value that it represents. It is no longer simply a symbol referring to something through social agreement, but an index signifying the actual identity of what it refers to: value. Economic value is an abstract idea emerging from – and being deictically crystallised in – money. There is no economic value outside of money. Any theory of value thus ultimately derives from habits of thought that are engendered by the artifact of money. Instead of reiterating the customary idea that money is a representation of value, we must invert the relation between signifier and signified and conclude that the very *concept* of value refers to money. To gain reflexive distance to the phenomenon of money we must be prepared to defamiliarise the notion of value and ask what the sign 'value' stands for. As we shall see, it is as deliberately vague and uncommitted as the word 'freedom', which might well serve as its synonym. It shares with symbols a contingency on social convention, but the particular convention it embodies is the delegation to individuals of the license to let their money refer to whatever they wish.

Like all fetishes, as David Graeber noted, money is a representation that brings into being that which it represents (Graeber, 2001: 251). This has become particularly evident with the last few decades of financialisation, during which money has been severed from the gold standard and assumed the capacity to propagate itself ever more independently of material production processes. The unprecedented dissociation of money from gold, materiality, and production has had formidable reverberations in the sphere of culture theory since the early 1970s, inspiring Jean Baudrillard's deliberations on the postmodern 'autonomy of the signifier' and the 'political economy of the sign' (Baudrillard, [1972] 1981, [1976] 1993). Two hundred years prior to this recent detachment from matter, the generalised commensurability promoted by all-purpose money had generated a colonial world-system that coalesced into the Industrial Revolution at its core. In integrating a global system of highly asymmetric transfers of material resources, money brought huge volumes of embodied labour, land, energy, and materials to late eighteenth-century Britain, converging in technologies for harnessing fossil energy that in turn reinforced accumulation (Hornborg, 2019, 2023a). The generalised pursuit of fetishised monetary value drove new and accelerating global resource flows, abetted by the new technologies.

Central to this seemingly inexorable logic of resource dissipation is the inevitable correlation between monetary value and physical disorder. Economic production processes simultaneously increase exchange-values and entropy (Georgescu-Roegen, 1971). Such is the algorithm which drives the metabolism of the modern technomass, the waste products of which are saturating the atmosphere and the biosphere. This kind of waste is not just a semiotic, cultural category, as the anthropologist Mary Douglas has proposed (Douglas, 1966). It is an incontrovertibly material phenomenon that reorganises the conditions of life on Earth. However, it is ultimately a product of semiotic processes – the emergence of a new kind of sign with disastrous consequences for the ecological systems into which it is introduced. As a sign system generated by life but threatening to destroy the conditions of life, all-purpose money is clearly a biosemiotic phenomenon that deserves urgent attention.

Although both money and fetishism are topics that have generated voluminous discussions elsewhere, remarkably few semioticians have applied their conceptual tools to illuminating them. As I have suggested, a semiotic analysis of fetishism can succinctly capture the conundrum that has preoccupied generations of culture theorists since Charles de Brosses in 1760 deliberated on the professed difference between African magic and European religion (Morris & Leonard, 2017). Sebeok devotes a chapter in his book *Signs* to 'Fetish Signs,' but unfortunately considers the phenomenon almost exclusively in the sense that it has been used in clinical psychiatry: as sexual attachment to an inanimate object or body part (Sebeok, 1994: 93–104). In psychiatry, fetishism has been approached as a disorder or 'deviation' whereby the fetishised object is detached from its original context, often in the form of synecdoche (a part substituting for the whole), and indexically associated with sexual gratification. There is very brief mention by Sebeok of the semiotics of political economy. Indeed, the semiotics of money appear not to have advanced much beyond Georg Simmel's classic *The Philosophy of Money* (Simmel, [1900] 1990). There have been sporadic attempts to apply semiotic perspectives on money, but they tend to be entangled in deliberations on particular aspects of economic history (e.g., Brandt, 2017; Oakley, 2023), framing the specific politics of money in semiotic terms rather than approaching the appearance of money as a general, evolutionary event with repercussions cascading through the semio-/biosphere. Given how fetishism in both the history of religion and psychiatry has been understood in terms of regressive misunderstandings, it may not be unreasonable to frame Marx's notions of money fetishism and commodity fetishism as similar ecosemiotic errors.

### **The Semiotic Basis of Ecological Crisis**

As Uexküll realised, the flows of matter and energy in ecological systems have always been contingent on flows of signs. The environmental histories of particular ecosystems can be narrated in terms of the semiotic flows that have organised them over time (Hornborg, 2001b). It is possible to show how different kinds of signs produce different ecological consequences. Up until the arrival of humans, ecosystems and the biosphere as a whole had only experienced the organising potential of indexical and iconic signs. Jointly, these two modes of reference had generated an increasingly complex biological diversity. The proliferation of new species and ecological niches

was an essentially semiotic process, reflecting the evolutionary emergence of new varieties of perception and communication based on indexical and iconic reference. The constitution of pre-human ecosystems was exclusively founded on the exchange of sensory signs, including auditory, olfactory, visual, and tactile signals between and within species. The arrival of humans introduced symbolic reference and language, emergent new forms of perception and communication that contributed to the transformation of many ecosystems. Symbols did not replace the operation of the other two modes of reference but added to and in some ways transcended them. Linguistic communication permeated ecosystems through cultural schemas such as ethnobiological classification systems, animistic metaphorisations of human-environmental relations, and food taboos. Finally, money and money-based economic signals, while ultimately products of symbolic imagination, overtook language in terms of transformative potential. Whereas human-environmental relations mediated by sensory and linguistic communication in some instances have been shown to enhance biological diversity (cf. Balée, 1994), economic sign systems everywhere pose a threat to biodiversity. From an evolutionary perspective, the emergence of new forms of semiosis has thus reached a point where it no longer increases diversity but undermines it (Eriksen, 2021, 2023). This paradox compels us to pursue a semiotic analysis of diversity.

Money is not in itself a symbol but presupposes symbolic reference much as symbols presuppose indexical reference. It qualifies as a new species of sign based on its exceedingly open mode of reference. It does not refer to any object by convention but owes its specific properties precisely to the absence of such conventions. The message conveyed by the money sign is an imputation of maximum *freedom* to the recipient: the freedom to interpret the message in any conceivable way, which means converting it into whatever resources or services its owner desires. Related to this semiotic novelty is another peculiar feature of modern money: it is a sign system with only one character. Unlike digital codes such as DNA molecules, alphabets, or musical scores, the money system has a single digit. It thus cannot compose and convey instructions or any other form of meaningful messages. The money sign is unique in lacking both a referent and a code. It is an emergent phenomenon in the semiosphere that has fundamentally transformed the logic of communication in living systems. The challenge for ecosemiotics is twofold: to understand how such a sign has emerged in the evolution of the biosphere, and to account for its impacts on ecology and diversity.

Hoffmeyer has suggested that the evolution of life on Earth has entailed a growth in what he calls 'semiotic freedom,' defined as "the depth of meaning an individual or a species is capable of communicating" (Hoffmeyer, 2005: 222, 434; Emmeche et al., 2002: 23). He chose to use the word 'freedom' to indicate that semiosis has become less and less determined by the constraints of natural law, which does support my contention that the replication of DNA molecules is too constrained by the laws of chemistry to qualify as a symbolic process. Over the course of evolution, Hoffmeyer shows, the sign has increasingly detached itself from its signified. He indicates that this split is the ultimate source of mind/matter dualism (Hoffmeyer, 1996). Indeed, the influence of symbolism is what justifies the analytical distinction between 'social' and 'natural' aspects of phenomena (Hornborg, 2017a). We have

seen how the emergence of symbolic reference and human culture illustrates the dissociation of sign from signified. The money sign is clearly a further step in the same direction. Symbolic thought and language have endowed humans with the freedom to construct their own imaginary worlds, but these have generally been collectively embraced through cultural conventions. If deployed by individuals in a completely idiosyncratic – that is, asocial – manner, symbolic reference may be perceived by the remainder of society either as divine inspiration or insanity. The uniqueness of the money sign is that it explicitly and deliberately detaches itself from the constraints of convention, encouraging individuals to interpret it as freely and idiosyncratically as they wish. In practice, of course, a number of factors influence people to spend their money in certain conventional ways, but *in principle* they are free to follow their own idiosyncrasies. Viewed as an aggregate global phenomenon, as we have seen, the only regularity that we can expect in monetary flows is that their expansion correlates with accelerating entropy.

It is often acknowledged that centuries of globalisation have reduced both cultural/linguistic and biological diversity (Emmeche, 2001; Maran & Kull, 2014: 47; Eriksen, 2021, 2023). As Claus Emmeche observes, “[w]hat looks like increased ‘semiotic freedom’ so to speak, becomes in fact increased uniformity and a standardization of nature” (Emmeche, 2001: 249; cf. Eriksen, 2021). In listing eight ‘key principles of ecosemiotics,’ Timo Maran and Kalevi Kull declare (as Principle 4) that “[h]uman symbolic semiosis (with its capacity of de-contextualization) and environmental degradation are deeply related” (Maran & Kull, 2014: 45). Having traced the feasibility of the money sign to the human capacity for symbolic reference, we turn now to how money is connected to globalisation, decontextualisation, and loss of diversity.

Fundamental to all semiotic inquiry is the insight that meaning is contingent on *context*. Over billions of years of evolution, semiosis has driven diversification and speciation by calibrating the genetic codes of organisms with their specific ecological contexts. However, the past six centuries of human history have been characterised by the diametrically opposite logic, closely tied to the ramifications of money: evolutionary success has been geared to being *independent* of context. In various ways, this tendency preoccupied the major social theorists of modernity in the 19th century, whose reflections were succinctly synthesised in Anthony Giddens’ concept of ‘disembedding’ (Giddens, 1990). Drawing on Simmel and other theorists of money, Giddens demonstrates the central role of money in generating the social conditions of modernity (Giddens, 1990: 22–26). Karl Polanyi, too, focused on the fundamental transformation of society brought about in 19th-century Britain by all-purpose money and the ‘disembedded’ market (Polanyi, [1944] 1957). Whether we refer to it as ‘capitalism’, ‘modernisation’, or ‘globalisation’, the logic of money has pivoted on decontextualisation. Commodity fetishism, cosmopolitan personalities, and universalising knowledge production all have this in common: they presuppose and encourage the capacity of exchange-values, people, and concepts to detach themselves from the particular and the local. Whereas premodern semiosis tended to enhance embeddedness in local contexts, modernity and globalisation have favoured mobility, interchangeability, and abstraction. In terms of political economy, this is to observe that ‘exchange-values’ have become hegemonic at the expense of ‘use-values.’ As Baudrillard has shown, use-values are semiotically determined (Baudrillard, [1972]

1981; Sahlins, 1976). Exchange-values, in contrast, are quantitative and prone to digitalisation.<sup>2</sup>

The expansion of money and the global market has transformed the selective pressures shaping the formation of both social and ecological systems. The ‘survival of the fittest’ is no longer primarily about calibration within ecological or local contexts, but may increasingly be a matter of transcending or emancipating oneself from the specific. The logic of selection in the modern, globalised world benefits both cultural and biological generalists (Hornborg, 2023b). The organisms, objects, and thoughts that are most likely to spread are those that are least dependent on context. This drift toward decontextualisation is ultimately a corollary of what I have proposed is a *fourth* mode of reference: a (money) sign that liberates interpretants to imagine its referent as they fancy, almost without constraints. The uniqueness of the money sign is that it does not communicate any indication of what it might refer to, whether through contiguity, similarity, or convention. This level of semiotic freedom appears to represent a threshold where its repercussions no longer generate increasing diversity but rather the opposite: accelerating entropy. It is the point where freedom from constraints shades into anarchy. Paradoxically, the sign that most historians and not least economists celebrate as the epitome of human progress is simultaneously the root of the global ecological crisis that threatens us, along with innumerable other species, with extinction. At this point in history, further progress must mean acknowledging the semiotic basis of the Anthropocene predicament and assuming control over our own semiosis. As Per Aage Brandt observes, “[w]e may have to discuss the possibility of ‘sustainable symbolization’ and, thus, of the sustainability of money as such” (Brandt, 2017: 156). He pertinently asks, “Can money be changed into something less pervasive and destructive?” (Brandt, 2017: 160).<sup>3</sup>

A semiotic perspective on money might focus on how it relates to context, difference, and entropy. It is a sign, invented by humans, that neglects all contexts, recognises no differences, and conveys no other message than to increase entropy. It thus operates so as to reverse the evolution of complexity and diversity throughout the planetary biosphere. Ironically, the thrust of this evolutionary process has for several billion years been a struggle *against* entropy by generating ever more complex layers of ‘difference that make a difference.’ The challenge confronting humankind is whether to allow money fetishism to mindlessly continue to dismantle such differences, diversity, and complexity, or to assume responsibility for the sign that was to serve us but has become our master. I have argued elsewhere that it would *in principle* be possible to redesign money so that it enhances contexts, diversity, and complexity (Hornborg, 2017b, 2019, 2023c). This is not the place to reiterate the scheme; suffice it to say that the basic idea is to recognise more than one currency and to distinguish between them as referring to separate spheres of value, separate functions, and separate scales of geographical reach. It would mean inscribing difference and

<sup>2</sup> The use-value/exchange-value distinction thus evokes Bateson’s and Hoffmeyer’s observations on the duality of analog versus digital codes.

<sup>3</sup> A similar line of reasoning is pursued by Yogi Hendlin in his semiotic critique of modern advertising: “The cultivation of particular signs is of the utmost importance in a species endowed with the capacity to meaningfully reflect on the type of signs it produces” (Hendlin, 2018).

sensitivity to context in the sign system through which we engage each other and the remainder of the semiosphere. In investing intentions in the design of our currently vacuous monetary signs, it would signify a momentous advance in semiotic agency.

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