This is a preprint versioon of the publication:

Maran, Timo (2023). Applied ecosemiotics: Ontological basis and conceptual models. In: Cobley, Paul; Olteanu, Alin (Ed.). Semiotics and its Masters II. Berlin: Mouton De Gruyter. (Semiotics, Communication and Cognition). DOI: 10.1515/9783110857801-008

There are some differences in wording and pagination.

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Applied Ecosemiotics: Ontological Basis and Conceptual Models

Introduction

For thriving as a discipline in the 21st century, it is essential for semiotics to address problems that the contemporary society and culture are facing. This includes both developing the theoretical models as well as applying these in analyses of critical topics. A set of issues that has raised a lot of concern in recent decades is the degradation of the natural environment, human induced climate change, global biodiversity loss, spread of invasive species, accumulation of waste and the connected effects and outcomes. Addressing this set of environmental problems may be challenging for semiotics, as the environment as an object differs from traditional objects of semiotic studies and as environmental degradation appears to be connected with the modernist episteme that has also partly nourished the 20th century semiotics. Such a challenge may, however, also be catalytic for semiotics to generate new perspectives.

A number of studies and reports from environmental sciences highlight severe consequences of human impact to the natural environment. To give here a few quantitative measurements, the UN Food and Agriculture Organisation reveals in its report "State of the World's Forests 2016" that agricultural land globally covers more than one-third (37.7 %) of all available land and that the number is steadily growing in the expense of forests and other natural landscapes (for instance, in the period from 1990–2015 the global forest area fell by 129 million hectares [FAO 2016: x]). An essential metric of the impact of human industry on the global climate is high atmosphere CO2 concentration. In April 2016 Mauna Loa

Observatory recorded in the high atmosphere a CO2 concentration of 410,28 ppm (parts per million), which is the largest concentration of CO2 in Earth's atmosphere that the human species has ever witnessed (Kahn 2017). Also the global species extinction rate has accelerated significantly during the industrial era, the process that has been often referred to as the "sixth extinction". It has been estimated, for instance, that "vertebrate species loss over the last century is up to 100 times higher than the [natural] background rate" of extinctions (Ceballos et al. 2015: 1).

These few measurements mark the interconnected set of problems that human civilisation is facing. In 2005, an environmental historian Jared Diamond listed 12 challenges that humanity needs to solve for avoiding the global environmental crises: destruction of natural habitats, degradation of soil quality, shortage of fresh water, overfishing and overhunting, effects of introduced and domesticated species on native species, human population growth and increased medial impact of people to the environment, global warming, chemical pollution, depletion of fossil fuels, human land use and its effect to Earth's photosynthetic capacity. Acknowledging such challenges has also led the research communities to issue a number of warnings and pleas for actions (e.g. Ripple et al. 2017).

In the last decades, the awareness of environmental issues has risen in the human sciences under the caption of environmental humanities. Paradigms of environmental history, ecocriticism, human-animal studies, environmental psychology, more-than-human geography and others have been engaged in dialogue to study relations between the human and the non-human world. This development has brought along substantial shifts in underlying scientific presumptions and ontologies for addressing animal or even material subjects. For instance, there has been a considerable interest towards material processes and their possible representations in human discourses. In the 1990's, Actor-Network Theory, led by French sociologist and philosopher Bruno Latour (1993, 1997), aimed towards a "flat ontology" that could incorporate social, material and semiotic processes. Some authors like John Law (2008) called this movement also "material semiotics" referring to its origins in Greimasian actant analysis that was later applied to the processes of the material world. Further, material ecocriticism (Iovino and Oppermann 2014) is an approach in literary criticism that has made an attempt to study material entanglements, the agency of things, and making meaning out of matter and things. The objects of study could be, for instance, the effects of non-living protagonists (volcanos, climate) on human lives and narratives, or the life-cycles of plastics, radioactive waste and other human-created substances.

In the background of environmental humanities, it becomes legitimate to ask, how could semiotics help in addressing the ongoing environmental change? Apparently environmental degradation has its roots and causes in the semiotical dynamics of the culture — what models humans use to make sense of the environment, what is the position of scientific knowledge in human worldviews, how well people know their surrounding environment and how they attribute or transpose meanings to the environmental structures. From the broader biosemiotic perspective, it is also crucial to consider that environmental degradation is in numerous ways related with the activities of other species, e.g. farming and cattle contributing substantially to CO2 and methane emissions, climate change altering ecological relations and food chains between wild species in countless ways. My belief is that by analysing sign processes, semiotics has a very special contribution to offer to other environmental humanities for understanding the roots of human induced environmental change. In this paper, I make an attempt to delineate some ecosemiotic principles as well as to gather and elaborate conceptual tools that could be used in such a research.

1. The ontological basis of ecosemiotics

From an ecological perspective, life is interactional and bound to material processes on the most basic level as ecological food chains are a part of more overwhelming cycles of matter and energy of the Earth. In the similar vein, there are interactions between semiotic processes and ecological processes. By the simpler iconic (resemblance-based) and indexical (association-based) sign relations, semiotic processes are connected to the world's structures and patterns (Maran and Kull 2014; Maran 2017b; Kull 2009). This does not mean advocating Newtonian determinism but rather pointing out that semiotic process are semi-autonomous in regard to the underlying cycles of matter and energy. Semiosis brings a certain flux to the natural world and gives to ecosystems a degree of freedom necessary for balancing external forces and changing conditions.

From this basis, ecosemiotics could enquire to as what extent human semiotic process or sign systems are in correspondence and support ecological processes – or to what extend they disrupt and counteract with these. Ecosemiotics has a reason to be suspective towards highly abstract and purely symbolic semiotic structures (e.g. artificial languages and codes) of human culture and to question their ability to sustain living processes. This observation is valid for both the object-level and the meta-level. On the meta-level, ecosemiotic' attention

on connections between culture and the environment clearly differs from critical discourses of cultural studies that build their identity on abstracted categories and their ideological oppositions. From an ecosemiotic viewpoint, these are rather ideologies themselves that are highly abstract sign systems expressing human social dynamics. Life on the other hand is complex, creates strange configurations and searches by behavioural and evolutionary means ways to overcome strict limitations. Also the recent attempts to connect biosemiotics and the humanities (Cobley 2016; Wheeler 2016) have expressed their worries towards critical discourses and emphasised the role of material and biological processes as a ground on which human culture is rooted.

In its attention towards environmental problems, ecosemiotics can rely on a number of thinkers from semiotics and beyond. There has been a tradition of thought in the second half of the 20th century that under different disciplinary labels has addressed relations between semiotic processes (both in organisms and in culture) and their environment. In the 1950–60s, Michal Polanyi (1958, 1966) wrote extensively about the rootedness of individual knowledge in the environment and sketched an entirely new sign type — *tacit sign* — that connects human cognised experience with precognitive perceptual and biosemiotic processes. A decade later anthropologist, cybernetic and polymath Gregory Bateson (1980, 2000) studied, among other things, relations between a semiotic entity (culture or an individual) and its surrounding context in terms of redundancy and complementary relationship and worked out the layered understanding of learning and communication that included their effects to semiotic systems. In 1980s, perceptual psychologist James J. Gibson (1986) described a keen balance between the agency of environmental structures and the activity of a living organism under the concept of "perceptual affordances". In his view, the environment has a strong ontology and indeed affords action and meaning: "The composition and layout of surfaces *constitute* what they afford. . . . [T]o perceive them is to perceive what they afford. This is a radical hypothesis, for it implies that the "values" and "meanings" of things in the environment can be directly perceived. Moreover, it would explain the sense in which values and meanings are external to the perceiver" (Gibson 1986: 127). Gibson's account is essentially important for ecosemiotics, as it allows addressing the significance and value of ecosystems separately from human semiosis.

These are a few examples from many authors belonging to or being influenced by pragmatics, cybernetics, complexity studies or ecology that can be used as a source of inspiration for ecosemiotics. In wider terms, this intellectual movement can be denoted as

"Ecological Postmodern" after Charlene Spretnak (1997: 73), who characterises this by the following criteria: ecological postmodernity perceives the world as a "community of subjects", considers the primary truth condition to be "the particular-in-context", understands "selves" to be processual, highlights the interchange between body and culture, sees reality as fragmented and therefore drives towards complexity-based scientific description. Indeed, the intellectual approach that stems from these ideas can be considered to be a novel episteme of thinking apart from modernist and postmodernist views.

The intellectual developments of the 20th century have prepared the ground for the ecosemiotic paradigm that formed as a subfield of semiotics in the 1990's. The term Ökosemiotik was apparently first used and defined by Winfried Nöth (1996) in a paper published in *Zeitschrift für Semiotik*. A few years earlier, Alfred Lang (1993) used the term "semiotic ecology" and proposed a corresponding research programme rooted in Peircean semiotics, and Swedish anthropologist Alf Hornborg (1996) published a paper on "ecology as semiotics". It was, however, in 1998 when the journal *Sign Systems Studies* (vol. 26) published in English two papers on the topic, one by Nöth (1998), another by Kull (1998) that proposed explicit definitions and delineations of ecosemiotics. This was three years later followed by a special issue of the same journal (Nöth and Kull 2001) that, in its turn, gave rise to a series of conferences and the commencement of university courses on ecosemiotics (for a more detailed overview of the history of ecosemiotics, see Maran and Kull 2014). Ecosemiotics has been thereafter defined, for instance, as "the study of sign processes which relate organisms to their natural environment" interpreted by Winfired Nöth (2001: 71) or as the semiotic discipline investigating "human relationships to nature which have a semiosic (sign-mediated) basis" (Kull 1998). More recently, we have specified ecosemiotics to be "a branch of semiotics that studies sign processes as responsible for ecological phenomena" (Maran and Kull 2014: 41). It may also be said that ecosemiotics is concerned with the semiotic processes that relate to or address the broader context of living biological processes (Maran 2017a: 5).

Based on the earlier studies, we can sketch four basic properties to characterise the ecosemiotic understanding of its research domain: dynamicity; historicity; multilayeredness; and contextualisation. 1) Dynamicity means here that the ecosemiotic sphere is not static but changing, and that this change arises from the inner dynamics of the objects. In other words, the ecosemiotic sphere brings along its own character to the research situation. This

dynamicity arises from the interplay between multiple actors: forces of material nature, agencies of different biological species and human groups and cultural texts.

2) This dynamics of the ecosemiotic sphere is not, however, occasional or incidental but derives from the earlier stages of the system. In biosemiotics a similar idea was described by Jesper Hoffmeyer (2014) as "semiotic scaffolding", where the semiotic development of an organism prepares ground and makes possible the future developmental directions of the same organism. The ecosemiotic sphere has *historicity* or descendance, whereas its past is not external but rather forms a memory, being a source of interpretation, autocommunication and recoding.

3) The ecosemiotic sphere has layers with different semiotic complexities and levels of abstractness that are simultaneously present and partly interwoven. The ecosemiotic sphere contains the semiotic potentiality of the physical environment, the communicational activities of humans and other species as well as symbolic representations of the environment in human signs systems. There are different types of connections and relations between these layers.

4) The ecosemiotic sphere is contextualised. This means that the ecosemiotic sphere as the object of study is situated in the broader environmental context. The boundaries of the ecosemiotic sphere are not strict but rather semi-surpassable and allow it to obtain identity within a broader semiotic environment through the flows of information and matter (here we might take inspiration from J. Lotman's [2005] semiosphere concept). Such partial closure is characteristic to ecological systems — water, flocks of birds and plant seeds are able to enter into and exit an ecological system — and the same principle should characterise the object of ecosemiotic studies.

These four properties give to the ecosemiotic approach a distinct identity. Ecosemiotics, as I perceive it, affirms the existence of objects with hard ontology but at the same time considers these as semiotically active, dynamically changing and having fluid connections with surrounding environments. We can think of the ecosemiotic sphere as described here in terms of ecosemiosphere — the concept that was proposed by American medievalist and ecosemiotician Alfred K. Siewers. According to Siewers, "an ecosemiosphere literally means an ecologicial bubble of meaning (borrowing the term "semiosphere" from semiotics). It involves not a "re-enchantment" of nature, but recognition of nature as a meld of physical and cultural communication, which can be considered spiritual as well as material" (Siewers 2014: 4), and the term also "extends earlier definitions

of specific symbolic cultures as semiospheres, or meaningful environments, into physical environments. It also extends onto a regional level the description in ecosemiotics of 'nature-texts' integrally related to physical environment" (Siewers 2011: 41). Siewer's ecosemiosphere is characterised by spatial organisation and localisation, which could help to delineate the otherwise amorphous object of study.

2. Conceptual toolbox for ecosemiotics

Ecosemiotic studies would benefit from an open epistemological stance as the environment and other objects of ecosemiotics tend to be more complex than our descriptions of these. Therefore we should not postulate strict typological distinctions but rather rely on *ad-hoc* approaches where conceptual tools and methods will be constructed in the course of the case study in solving particular problems. Conceptual tools and typologies themselves are modelling devices of the human species, encumbered with particular cultural, ideological and historical backgrounds, and should therefore be used carefully. Objects of ecosemiotics are, however, "strange" in the sense that they have their own structure, memory and often their own umwelt or umwelts. The autonomous nature of the research object means that relations between the object and the researcher need to be reciprocal and dialogical, and hence the open epistemological approach is suitable. The open epistemology, however, does not mean relying on incidental or ambivalent metalanguage. There is still the possibility to develop a concrete conceptual framework. What is specific for this approach is treating concepts and methods like tools in the toolbox that are used, combined and modified according to the requirements of the specific research task at hand.

In following, I will arrange a set of concepts and models for the practical ecosemiotic analyses. In doing so, I will review existing research literature in ecosemiotics and beyond and also draw examples from my earlier studies on nature writing (analysis of the works of an Estonian author, Fred Jüssi, and nature representations of the Eastern Estonian region Alutaguse, [Maran 2014; Maran and Tüür 2017]) and human-animal relations (cultural reactions to the emergence of the Golden Jackal in Estonia, changing relations to Jackdaws in Tartu, [Maran 2015; Maran 2016]). The approach that I use here combines three types of entities: the *ecosemiotic sphere*, which is considered to be a general concept for the ecosemiotic research domain; *activity centres*, which are the loci in the ecosemiotic sphere that have distinct identity and that bring along dynamics and change; *relations* between

activity centres that are the primary object of the ecosemiotic study. I do not make a clear-cut division between the object-level and meta-level as the proposed research models and concepts themselves are the derivatives of the underlying cultural and academic tradition (thus having connection to the object level).

There seems to be three types of activity centres in the ecosemiotic sphere: 1. Semiotic potentiality of the material environment; 2. Communicative relations between individuals and groups belonging to different biological species (including humans); 3. Human cultural texts with their structure and memory. The extent and reach of effects of these types of activity centres differ: the semiotic potential of the material environment is local and spatially limited, whereas textual structures are able to bridge different cultures and cross large spatial and temporal distances. The three types of activity centres combine into two contact zones: 1. The material environment as a vehicle of mediated communication; 2. Cultural representations of environment as means for social communication. These contact zones need special attention as the processes in these thresholds are major sources of dynamics and change in the ecosemiotic sphere (see Fig 1.).

2.1. Semiotic potentiality of the environment	*2.2. Environment as a vehicle of mediated communication*	*2.3. Direct communicative relations among humans and animals*	*2.4. Environmental representations as means for social communication*	*2.5. Human cultural texts in their relations with environment*
Perceptual affordances Resource criterion Ecofields Environmental signs	Environmental mediation Semiotic pollution Semiocide Semiotic allowance	Biotranslation Umwelt transition Ecological codes	Semiotic modelling Transposition of meaning Dissent	Replacement of 0-nature Nature-text Representational / Mimetic / Complementary / Motivational relations Forest model

Figure 1. Types of ecosemiotic activity centres, their contact zones and the placement of conceptual tools.

The focus of ecosemiotics is intrinsically dynamic and aimed at interactions, influences and hybridisations between different activity centres in the ecosemiotic sphere. In a particular research situation, the entering point, from which the ecosemiotic sphere is approached, may be different (as mapping a spatial region, focusing on the particular cultural text, or

describing a case of human-animal communication). From this starting point, however, the scope of analysis should be broadened to cover all other activity centres and their possible relations.

2.1. Semiotic affordance of the material environment

Describing the material environment, its structures, patterns, and potential to induce semiotic relations is an essential part of ecosemiotic study. Patterns and structures of the material environment endow *perceptual affordances* (*sensu* Gibson 1986) to humans and animals, as well as related sign processes. For analysing affordances of the environment, it is not enough to describe environmental structures, but these need to be juxtaposed with animal physiologies, behaviours and ecologies, following Jakob von Uexküll's (1982) umwelt analysis. Incorporating animal umwelts allows the bringing forth of detailed correspondences of meaning between animal and environment. Describing relevant resources for an animal in the given environment can be done systematically by the concept of *resource criterion* (Farina 2012), which describes an environment by locating different resources — either material, biological or cultural — that its inhabitants need and seek for. Farina's view is a semiotic one, as resources are not considered as immediately available for species, but mediated through the interfaces or *ecofields*, as Farina has named these. Adopting Uexküll's view, Farina describes eco-fields as "space configuration meaning carriers" (Farina 2006: 32). Eco-fields depend on both the physical shapes and structures of the landscape as well as on the perception and life functions of the given species. An important issue becomes, therefore, how well species recognise ecofields, what could be their obstacles in recognising relevant ecofields (e.g. human induced noise and other disturbances). Such a resource centred view can also be used for pinpointing areas in which different species meet, and indicating the grounds for conflicting relations between species.

For more detailed analysis of ecofields, we may benefit from typological analysis of the environmental sign, deriving from indexicality in Peircean terms. Many semiotic authors have elaborated on specific sign types suitable for analysing environmental semiosis. Charles Peirce's classification of indexical signs distinguishes between designators and reagents (CP 8:368 fn23): designators point to something in the environment, whereas reagents are based on true causal connection. Thomas A. Sebeok (2001: 93) lists "symptom, cue, clue, track, trail" as types of index in the environment. A possibility for describing different

environmental signs would be focusing on the relationship between the object and the representamen, whether it is easily accessible or not, whether it is particular or abstract/manifold (cf. Maran 2017b). For instance, animal tracks and seasonal change are both indexical signs in the environment, but they have very different dynamics. Animal tracks are specific patterns that have a strict casual connection with the animal that has left them and have therefore also a particular and well-limited sign relation to the object. Seasonal change, on the other hand, is a process manifested in many perceivable changes in the environment, and its object is an ambiguous, more compound object than a singular entity. It should be noted that there is indeed a broad variety of semiosic processes in the environment that may require a more detailed description.

2.2. Material environment as a vehicle of mediated communication

Another semiotic process in relation to the material environment that ecosemiotics should address is *environmental mediation*, as the question of how animals and humans mark their presence, express their identity and communicate though changing material environments. There are many possible examples of such processes from territory markings of carnivores to fences and gardens built by humans. In environment-mediated communication, the altered semiotic structures as messages become semi-independent. The semiotically altered environment has semiotic potentiality and an effect outside of the temporal frame of communication, and their effects may also be different from what the communicator has intended. This brings us to the question of *semiotic pollution*, where the activities of one species in the environment changes its qualities to the extent that it starts to disturb the semiotic processes of other species. Semiotic pollution was a concept proposed by eminent German semiotician Ronald Posner (2000) to describe the breakdown of sign systems and sign mediation due to internal or external disturbance. Examples of semiotic pollution are the effect of noise on the semiotic processes and overregulated communication codes that obstruct the normal sign processes. We may see, for instance, the effects of noise in the environmental realm in a situation where artificial light sources disturb newly hatched turtles on beaches (Kamrowski et al. 2012). Sea turtles have an inborn urge to move towards the brightest light source that in the natural conditions would help them to orient into open ocean. But the same instinct leads them in human-altered environments to asphalt roads, when they get killed by transportation.

A type of the semiotic pollution is *semiocide*, where through environmental change the impact of one participant upon another is intentional and detrimental, and where a semiotic subject is actively aggressive towards the other semiotic subject. According to the author of the concept, Ivar Puura (2013), semiocide is "a situation in which signs and stories that are significant for someone are destroyed because of someone else's malevolence or carelessness, thereby stealing a part of the former's identity". The concept of semiocide would provide ecosemiotics with a good tool for analysing conflictive relations between different species and human groups that are mediated by the environment. For instance, closing openings of the ventilation shafts in flat-houses to expel nesting swifts, jackdaws and other birds can be considered semiocidal activity.

To sum up, the role of environmental structures in semiotic processes is manifold. Environmental structures have the potentiality to trigger different types of sign relations in accordance with the specific animal Umwelts. On the other hand, animals are able to change the environment for communicative means and, through this influence, the capacities of other animals to engage with the environment. The outcome of these processes is often detrimental as notions of semiotic pollution and semiocide demonstrate, but in principle it could also be beneficial to other participants. Through the mild human influence on the natural environment, it is possible to create novel ecofields that other species can recognize and use. The corresponding semiotic process could perhaps be named *semiotic allowance*, and it requires analyzing and modelling both the umwelts of the involved species as well as the properties of the material environment. Finding and using such new potentials to mitigate environmental conflicts could be one aim of the ecosemiotic study.

2.3. Direct communicative relations in the environment

Analysing animal communication is a relevant part of ecosemiotic study as communication always happens in a particular environment and is related with this in various ways. If different species and human groups inhabit the shared environment, then their communicative interactions may also influence their being in the environment. In animals this dynamics can be described by the concept of *biotranslation*, which was originally understood as the transfer of a message from the umwelt of one species to another (Kull and Torop 2001). For biotranslation to become possible, there needs to be some connection or overlap between different umwelts, and therefore biotranslation mostly takes place between species that are

ecologically, behaviourally or physiologically close to one another (Kull and Torop used species of tits and their interpretation of a common predator as an example). For analysing the temporal dimension of change in animal umwelts, the concept of *Umwelt transition* proposed by Morten Tønnessen (2011, 2014) can be used. Umwelt transition describes the difference between two stages of the same umwelt before and after some decisive event. For the aims of ecosemiotic analysis, we could narrow our attention down and describe the difference between the aspect of animal umwelt related to environment (which is one of four basic types of umwelt relations according to Uexküll) before and after biotranslation or some other ecosemiotically relevant event (semiocide, semiotic pollution, etc.). As a communicative event, biotranslation can create connection between different umwelts and lead to a greater similarity between them in relations to the environmental structures.

Interactions between communication and environment are indeed manifold. There is a rich body of evidence on how the properties of the communication channel influence the properties of the signals conveyed (Bradbury, Vehrencamp 2011). It is also known that species can change their communication modalities depending on how the communication channel is used by other animal species (e.g. Kight et al. 2011). If we further pay attention to ecological communities, we may notice the entanglement between properties of the material environment and messages sent and received by animals in this environment. Thus, there is reason to describe *ecological codes* as communicative regularities specific to the given ecological community. The ecological code can be "defined as the sets of (sign) relations (regular irreducible correspondences) characteristic to an entire ecosystem, including the interspecific relations in particular" (Kull 2010: 354). In my understanding, there are three basic properties of the ecological codes (Maran 2012): 1. Ecological codes are distributed, open and involve different species. As species have different perceptual organs, Umwelts and relation to the environment, no single individual or species has full perception of an ecological code. Instead, every single species and organism involved in an ecological code has a partial variation of the convention. 2. An ecological code is built upon and incorporates the consistencies, constraints and habits existing in a particular ecological community. An ecological code rests on indexical relations, as it is in these that representamen–object relationships surpass and remain independent of any specific interpreter. 3. An ecological code uses different memory types (following Jablonka and Lamb 2005) having both cognitive and non-cognitive (or conscious and unconscious) aspects. A regulation can be fixed in different memory types simultaneously: for instance, it can be fixed partially in the physical

regularity, partially in the genetic memory of a species, and partially in the cultural memory of another species. The concept of ecological code may help us to describe the communicational integrity of ecosystems and to understand the involvement of human cultural semiosis in these (which may be more or less corresponding).

2.4. Cultural representations of environment as means for communication

As ecosemiotic study embraces both animal and human communication, we also need to address the human communicational activities in regard to environmental processes. A lot of research about the spread of knowledge and attitudes on environmental issues among humans has been done within the paradigm of Environmental Communication Studies (e.g. Hansen and Cox 2015). The use of language, including specific vocabularies and connotations of environmental concepts, is also studied by Ecolinguistics (e.g. Stibbe 2012, 2015). Here I will shortly discuss some aspects of how human communication interacts through semiotic means with environmental signs and animal communication.

In perceiving, interpreting and representing environmental objects or animals, humans combine the semiotic potential (appearance, biocommunication) of the object with their own cultural presumptions and models. Cultural models provide here a ground of reference for comparisons and generalisations that are often used to give a higher status to the entity under consideration. As a simple example, endurance, long lifespan and spread crown of the oak tree in combination with the underlying cultural model of "stability/timelessness" has given oak the status of a national symbol in several countries. This, in its own turn, has enhanced the protection and cultivation of oaks in urban greenery in comparison with many other tree species. In animals, the ground of *semiotic modelling* is often anthropomorphism as similarity to humans with attention to special morphological features of large eyes, upright position, digits on first limbs, etc. It can be considered that such animal symbolization in cultural-mythological consciousness forms a part of "the much more general semiotic landscape that influences interpretations of each and every animal species" (Mäekivi, Maran 2016: 214). In addition to anthropomorphism, Czech philosopher of science Stanislav Komárek (2003: 108–116) has described other bases on which animals can be modelled by biomorphism, technomorphism, psychomorphism or sociomorphism. Such modeling appears to have a double effect – on one hand it accentuates the given species or environmental object in the

human discourse, but on the other hand it conceals and covers many properties that the animal or environmental object has in its original ecological context.

A notion that can be used for analysing such processes is *transposition of meaning* where cultural meanings that have some social or cultural causes are attributed to the environmental object or animal species. In classical ethology, a phenomenon of the displacement behaviour is known where an animal in conflict or stress reacts towards an object that seems to be irrelevant for the current situation. For instance, a blackbird in a territorial conflict may start lifting leaves up from the ground or start cleaning its feathers, thereby freezing the uncomfortable situation. It seems that there exists a similar conflict dynamics in human societies. Conflicts between social groups, which might have roots in deep social or historical contentions, are projected onto animal species or environmental objects that do not have any direct relation with the conflict. Morten Tønnessen (2011) described such dynamics with the example of Norwegian wolves, where tensions between local farmers and industrial agriculture have been projected onto the image of wolf, which stands as a symbol of forests and forestation. In the Estonian context, there is a similar example of the flying squirrel (*Pteromys volans*) and forest management, where the flying squirrel has become a symbol of old forests and afterwards also a symbol of contentions between the forest industry and environmental originations. The transposition of meaning may have real-life consequences to the species involved – for instance, through the implementation of species management strategies.

The semiotic activity of the environmental phenomena or animal species and its interpretation by humans may combine differently. In some cases, the environmental object may also demonstrate *dissent* or non-concordance with the human interpretation. The concept of dissent was proposed in this context by Australian semiotician David Low (2008) who emphasised the necessity of including the environment as a semiotic subject into the study of environmental communication. He departed from the Peircean semiotics and highlighted a split between an environmental process itself and human interpretation of this as an important characteristics of the environmental conflicts. According to his view, environmental processes enter into environmental communication as dynamical objects of the sign *sensu* Charles Peirce. For example, the pollutants in water act as dynamical objects, whereas their perceived characteristics and effects act as immediate objects of the sign. In such situations, people search for the correspondence between dynamical and immediate objects – that is, they adjust and adapt their sign-mediated knowledge towards the environmental processes

themselves. The tension between semiotic activities of the environment and human cultural interpretations may unfold differently in different cases. Also the animal participant may obtain the position of dissent in regard to the environmental discourse. This was a case, for instance, in the emergence of the Golden Jackal (*Canis aureus*) in Estonia (Maran 2014, 2016) with a following interplay between the jackal's own communicative and behavioural activities, and human interpretation and modelling (relying on the opposition of their own and alien and other models) of the new and strange species. For ecosemiotics, such a frame of analysis would mean working simultaneously on different hierarchical levels and analysing transferences and attributions of meanings across scales.

2.5 Dynamics between cultural texts and environment

Another locus of ecosemiotic analysis is texts and textual representations, covering a number of cultural artefacts from nature essays and field guides up to journal articles and visual media content. What makes textual representations specific as a research object is their distinct structure. Representations have structural, compositional and narrative integrity deriving from the codes and languages used for creating them, and that gives to texts a certain autonomy and independence. Nature representations may easily outlast the environments they are representing. This endurance of the texts is similar to the understanding of symbols as being alive, that is, symbolic signs having their own subjectivity and agency that may alter the surrounding culture (Nöth 2014). Texts with their own agency can influence human understanding of nature and, through human action, change the material environment by replacing this with human altered environments. This dynamic has been described in detail by Kalevi Kull (1998: 366) as *replacement of 0-nature* (nature as it is) by 2-nature (nature remodelled by humans).

However, we may also see that relations between environmental semiosis and cultural semiosis are often not so straightforward. The relationship between text that represents nature and its object(s) of representation is not always univocal, but cultural texts attach themselves to various semiotic anchoring points in the environment. To explicate and explain these interconnections between nature writing and the environment, I have proposed the model of *nature-text* (Maran 2007). According to this model, ecosemiotic research is considered to have at least a double object: “in addition to the written text that speaks about nature and points to nature, it should also include the depicted part of the natural environment itself,

which must be, for the relation to be functional, to at least some extent textual or at least textualizable". The formal characteristics of nature representations – the literary and narrative strategies employed in the text – are often organised and shaped according to the particular environmental relationship it represents. Thus, the nature-text model asks what kind of literary devices are there to convey what kind of human-environment relation (message) in the context of what kind of environment (see Maran and Tüür 2017 for discussion and examples).

From a semiotic perspective, the written text and the environment are tied together in multiple ways: by *representational*, *mimetic*, *complementary* and *motivational* relations (Maran and Tüür 2017). On the most basic level, the nature representation – such as, for instance, a nature essay – *represents* the environment in a certain culture-specific way and through the interpretation of a particular author. Nature writing can be *mimetic* in the sense that the structure or the narrative of the text can repeat certain environmental or physical sequences. For instance, in an animal story the sequence of the events can be determined by the actual biological life cycle or the daily activities of the animal. At the same time, the text and the environment can be in a *complementary* relationship so that the reader's experience of the text and of the environment become actualised simultaneously in the reading process, and mutually support each other. In such a case, not all the meaning relations potentially present in the environment need to be represented in the text, yet the author presumes that his/her readers are familiar with the common characteristics and properties of the environment. In the case of a complementarity relation, interpretative loops emerge between the text and the environment; the text is interpreted with reference to the environmental experience, and the environment is interpreted on the basis of textual knowledge. The environment may also inspire an author to create a specific nature representation, in which case we may talk about the *motivational relationship*, and that connects back to the topic of perceptual affordances and environmental signs discussed earlier. Different meaning relations can be active at the same time; they can combine in complex ways and interact with one another – which all create a diverse and multidirectional fabric of meaning between text and environment.

Depending on the type of material we are analysing, there may not be a symmetric relationship between the text and the environment, and the inclusion of other types of theoretical models may become necessary. Especially in regard to a local and place-specific literary tradition, we might benefit from the models that defy the clear structure and limits of

the text. With this aim in mind, I have recently proposed to take the metaphor of the forest as a basis of semiotic modelling (Maran 2018). In an ecological sense, the forest is characterized by the extensive presence of decomposers, detritus food changes and organic matter in different stages of decay. As a semiotic system, the forest is unlimited, de-centralized, regenerative, and self-organizing. In the *forest model*, we may highlight the following characteristics of the literary object: meanings and codes as shared partially in variations; being in the forest is equal to tolerating meanings and becoming an object of meaning attribution; the basic unit of analysis in the forest is a focal point where semiotic activities and local conditions meet; in forest characters, meanings and qualities have strong ontology and history; and there is a surplus of semiotic material beyond the semiotic processes currently active. As a model, the forest is considered to be locally shaped and regulated, accidental and overwhelming, but at the same time well integrated. This type of modelling has turned out to be beneficial – for instance, in describing a place-specific nature writing of essayists Juhan Lepasaar and Edgar Kask from the Alutaguse region in Eastern Estonia whose work had a heterogeneous structure and reached in their meaning relations beyond the formal dichotomies of author/text, culture/nature, content/form, etc. (Maran and Tüür 2017). To sum up, there appear to be different types of text-environment relations: in some cases, distinctions and oppositions are easy to draw, whereas in other cases, text and environments are more intimately integrated. Studying the dynamics and environmental effects of these different types of texts could be an aim of an ecosemiotic framework.

Conclusions: has the age of ecosemiotics come into being?

Environmental humanities and ecosemiotics have for a long time understood the necessity to overcome the cleavage between culture and nature, between cultural analysis and environmental research. Up to the present, this recognition has led to few practical outcomes, mostly because of the lack of suitable research methods and conceptual tools: hence the call to develop applied ecosemiotics with practically oriented and robust research methods. In these pages, I have brought together and systematised a number of semiotic concepts that can be used as tools in ecosemiotic research. On a general level, we can bring forth concepts that stress the entanglements between different activity centres (ecological codes, nature-text) and those that retain and strengthen the identities of the semiotic subjects (semiocide, dissent). It is also possible to distinguish between processes that transpose meanings from one activity centre to another (biotranslation, meaning transfer), and those where one activity centre

disturbs or challenges the semiotic processes in the other (dissent, replacement of 0-nature). As a combination of these different processes and concepts, the ecosemiotic research area is apparently dynamic. A task of ecosemiotics could be mapping semiotic relations in any given research object, analysing causes of instability in the system and bringing forth possibilities to overcome these.

There are apparently a number of environmental problems that would deserve semiotic attention and where semiotics could provide a new understanding about the underlying causes. The present paper proposed a conceptual toolbox that can be the subject of further elaboration and testing in practical analyses. With the aid of suitable conceptual tools, we could consider developing applied ecosemiotics as a critical discipline of studying human-environment relations. Such an approach might also be able to renew the theory of general semiotics by bringing this more closer to the ground, to give it more of a kind of real-life relevance and practical applicability.

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