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## Tectonic Indexicality and Architectural Semiosis

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Faculty of Science  
Charles University



Sixteenth Annual  
Gatherings  
in  
*Biosemiotics*

July 4 to July 8, 2016  
*Prague*

Edited by Jana Švorcová & Andres Kurismaa

## The program of *Sixteenth Annual Gatherings in Biosemiotics*

**Monday July 4<sup>th</sup>**

**Chairman: Karel Kleisner**

**14.00** *Welcome and introduction*

**14.30 Kull** *Unsolved problems in biosemiotics*

**15.00 Hoffmeyer** *Semiotic individuation and free will*

*Coffee break*

**16.00 Anderson – Bisanz** *Biopower: Entangling moralities and mortalities*

**16.30 Maran** *A typological approach to environmental signs with an emphasis on their underdeterminancy*

**17.00** *Welcoming buffet at Karolinum, Ovocný trh 3, Praha 1*

**Tuesday July 5<sup>th</sup>**

**Chairman: Kalevi Kull**

**9.00 Faltýnek – Lacková** *Arbitrariness is not enough*

**9.30 Nielsen** *Molecular information theory: a common ground between bioinformatics and biosemiotics?*

**10.00 Cvrčková et al.** *Extending the concept of behavior beyond animals: not only a terminological issue*

*Coffee break*

**Chairman: Don Favareau**

**11.00 Markoš – Švorcová** *Meanings in biosphere: we have never been dead and we have never been individuals*

**11.30 Karatay – Denizhan** *Prions: a missing link?*

**12.00 Uhlíř** *Representational systems in zoosemiotics and anthroposemiotics: what have the so-called „talking animals“ taught us?*

*Lunch break*

**Chairman: Timo Maran**

**14.00 Sharov** *Reciprocal scaffolding and evolution of composite agency*

**14.30 Kleisner – Brejcha** *On the functionality of semantic organs*

**15.00 Menant** *Meaning generation for constraint satisfaction. An evolutionary thread for biosemiotics*

*Coffee break*

**Chairman: Victoria Alexander**

**16.00 Kurismaa – Pavlova** *Embodiments of interaction: dynamic mechanisms*

**16.30 Harvey** *A new perspective on the heterogeneous nature of situated, real-time languaging*

**17.00 Fester – Cowley** *Language, languaging and man-made coding*

**Wednesday July 6<sup>th</sup>**

**Chairman: Alexei Sharov**

**9.00 West** *Interpretants of Zoey's world*

**9.30 Vitti-Rodriguez – Emmeche** *Animal abduction: Can non-human animals make discoveries?*

**10.00 Tønnessen** *A brief history of the cultural semiotic of wolves and sheep*

*Coffee break*

**Chairman: Paul Cobley**

**11.00 Bernstein et al.** *The vocal repertoire of Tibetan macaques (*macaca thibetana*): a quantitative classification*

**11.30 Jaroš** *The semiotic life of cats: a journey into the feline mind*

**12.00 Kiiraja – Tønnessen** *Fear not – socialization of captive wolves*

*Lunch break*

**Chairman: Fatima Cvrčková**

**14.00 Alexander** *When mimicry is a sign*

**14.30 Ireland** *From life to architecture - to life*

**15.00 Mäekivi** *Intra- and interspecies communication in urban environments*

*Coffee break*

**16.00 POSTER SESSION**

**Augustyn** *Natural kinds in linguistics*

**C. Rueda** *Breeding success between species belonging to genus *Serinus* and *Carduelis* (Aves: Passeriformes): The origin of a new species in captivity.*

**Goméz et al.** *Mimetic relations between Hepatitis C virus RNA genome, tRNA and host defence mRNAs*

**Griffin** *Foundationless objective reality*

**Hénault** *Biosemiotics and cognition*

**Lee** *Tectonic indexicality and architectural semiosis*

**Löeckenhoff** *Talks with my elephant: on semiotic transfer*

**Rossmannith** *Jointly structuring shared spaces of meaning and action - the development of increasingly complex semiotic processes in infant-caregiver-object interactions over the first year of life.*

**Stella et al.** *Nondestructive, fast, ultraviolet: the application of uv photography in ecology, taxonomy, and evolutionary biology*

**van der Elst** *Tapping into the languages of the Land*

**Vymazal** *Systemic Psychotherapy, systemic counseling and hypnotic processes reflected with the nine sign aspects of Peirce*

**Waisse et al.** *Effects of high-diluted agents for leishmaniasis explained as a biosemiotic phenomenon*

**Thursday July 7<sup>th</sup>**

**Chairman: Sara Canizzaro**

**9.00 Kull – Velmezova** *Umberto Eco on biosemiotics*

**9,30 Patoine** *Rethinking art, regulating growth: Lotman's evolution from the artistic text to the semiosphere*

**10.00 Cannizzaro** *What are the implications of a biosemiotic concept of information for the analysis of emotions in nonverbal communication?*

*Coffee break*

**Chairman: Anton Markoš**

**11.00 Coble** *Freedom, repression and constraints in biosemiotics*

**11.30 Favareau** *The biosemiotic glossary project: intentionality*

**12.00 Cowley** *Biosemiotics and the natural sciences: Framing or bridging?*

*Lunch break*

**Chairman: Stephen Cowley**

**14.00 Peng** *Signs constructed by cultural umwelt: taking moss in chinese culture as an example*

**14.30 Han** *Umwelt as a Taoist female principle: Re-reading the Tao Te Ching*

**15.00 Harney** *A feeling for what comes next*

*Coffee break*

**16.00 Calic** *Biosemiotics and bruxism: what does tooth grinding have to do with sign processes*

**16.30 Journal Editorial Board meeting**

**17.00 General assembly ISBS**

**18.00 ISBS board meeting**

**20.00 Social dinner**

## Friday July 8<sup>th</sup>

**Chairman: Myrdene Anderson**

**9.00 Rodríguez Higuera** *Conceptualizing a minimal framework for the implementation of biosemiosis*

**9.30 Nováková, Hermann** *World is not an object: Work of Zdeněk Neubauer as inspiration for biosemiotics in Prague*

**10.00 Velmezova** *Biosemiotics without biosemiotics: A view from the Moscow side of Tartu-Moscow semiotic school*

*Coffee break*

**Chairman: Morten Tønnessen**

**11.00 Yu** *The deep-shaping power of the human modeling process*

**11.30 Bennett** *Dark Romance: Necrosemiotic axiology and the semiotic life cycle*

**12.00 Nouvel** *Biosemiotics and phenomenology: Erwin Straus, phenomenologist or biosemiotician?*

*Lunch break*

**Chairman: Jesper Hoffmeyer**

**14.00 Bielecka – Marcinów** *A constructive approach to mental misrepresentations in human and non-human minds*

**14.30 Milkowski** *Is empiricism empirically false? Lessons from early nervous systems*

**15.00 Tureček – Řídký** *What do animals think about speciation?*

*Coffee break*

**Chairman: Karel Kleisner**

**16.00 Brier** *The consequences of the foundational nature of autopoiesemiotic agency*

**16.30 Vehkavaara** *Habits or dispositions – of their biosemiotic and non-semiotic fixation*

## When mimicry is a sign

Victoria N. Alexander

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Mimicry seems the perfect topic for biosemiotics. Tasty butterflies evolved to look like bitter butterflies would quite literally be *signs* of toxins to predators that avoid them. The fact that they are *false* signs (because not actually toxic) makes these mimics even more interesting—a false sign is more clearly a *sign*, not a symptom.

I've been researching mimicry since 2000, following the world's most famous lepidopterist Vladimir Nabokov. I've never presented this work at any gatherings, because, well, I've come to believe that the mimicry I study, the dead-leaf butterfly and the viceroy-monarch, may not be mimicry at all. At least, they do not appear to have been *shaped* by natural selection *as signs*. The viceroy seems either to be a neutral product of convergence or perhaps hybridization. The dead-leaf butterfly seems to be a "hopeful monster," appearing in its fantastic disguise in a single generation. The dead-leaf may have been later selected for fitness, but it does not seem possible that it is the product of gradually-acting selection. Selection might gradually shape a *camouflaged* insect, because it just has to be dull colored or green and blend in any which way. It is more difficult, statistically speaking, for selection to gradually shape a form to look exactly like another. It goes against the general idea of natural selection to suppose that there could be such a specific, predefined goal.

Even staunch gradualists realize that a good-enough resemblance must be caused by chance first before natural selection would be able to act on it *as* a resemblance. And, if natural selection were shaping mimicry, the model would have to be in a state of evolutionary stasis while the mimic continues to mutate at a normal level. We must also consider that natural selection would not be able to create better mimicry than would suffice. This is what we find in the dead-leaf butterfly, which boasts of a few faux fungus spots along its faux leaf vein, adding a degree of realism unnecessary to fool predators. Indeed in many cases, the resemblance serves no purpose. Convergence, hybridization, or even pure chance seem to me more logical explanations for many supposed mimics. With DNA sequencing, we are discovering more and more about the factors besides selection that can produce resemblances.

I don't want my fellow biosemioticians to be disappointed by my argument. My research has taught me something else about signs. If we remove natural selection as the *creator* of mimicry, we may see more clearly how a sign, any sign, might first appear as a sign. Are signs gradually refined over evolutionary time? Or do they appear suddenly? I will talk about the relevance of both scenarios for our work.

"Chance, Nature's Practical Jokes, and the 'Non-utilitarian Delights' of Butterfly Mimicry," *Fine Lines: Vladimir Nabokov's Scientific Art*. Eds. Stephen Blackwell and Kurt Johnson. New Haven: Yale University Press, 2016.

"Nabokov, teleologie a hmyzi mimeze," *Kráska a zvíře. Studie o vztahu estetických a etických hodnot zvířat*. Eds. Ondřej Dadejík, Filip Jaroš, Martin Kaplický. Trans. Filip Jaroš. Prague, Czech Republic: Dokoran, 2015.

"Neutral Evolution and Aesthetics: Vladimir Nabokov and Insect Mimicry," Working Papers Series 01-10-057 Santa Fe: Santa Fe Institute, 2001.



## **Biopower: Entangling moralities and mortalities**

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While biosemiotics moves in the direction of liberating both biology and semiotics from strict observance of the paradigms of the 19th and 20th centuries—via evo-deve-eco and the ontological turn—we propose a glance back as well as a sharper focus on the conditions of the present and foreseeable future.

Biophilia did not have to wait for Edward O. Wilson's volume of that label (1984). Societies have long been grounded in as well as on their "natural substrates", inclusive of other living species. Umwelten consist in "significant surrounds", although determining with precision "significance" will have to be put aside for the moment. The "intert" once cognized is scarcely "inert".

Biophobia, on the other hand, we first notice during modernity, although earlier societies could be breeding-grounds for culture-bound fears, taboos, waste, discord, and sacrifice as well, and indeed they all indelibly degraded their ecologies. David W. Orr joined scores of scores of critical observers with his 2004 *Earth in Mind*. This literature first generated, then critiqued dichotomies such as nature-nurture and biology-culture and inheritance-learning, and many more.

Biophilia and biophobia discourses continue apace, but seem deaf to each other. Biophilia as a philosophy falls short of fully characterizing our global conditions today, and can seem to be satisfied with patting us humans on the back; biophobia tends to stop with a litany of short-sighted flaws in our ecological relations among and between individuals, societies, and their wider, inclusive, Umwelten.

We bring together these discourses through the prescient lectures that Michel Foucault delivered at the Collège de France in 1975-1976 (2003 [1977]), and in which he introduced the term biopolitics. Foucault addressed a bevy of pathologies endemic in the societies he witnessed at that time; these pathologies persist and indeed have flourished.

Topics Foucault highlights under the term biopolitics range from racism- having power over life- the right to take life or let die. Hence, we see biosemiotics as a legitimate field to pursue problems of population both as biological and as a problem of power. We approach them as collective phenomena which determine the biological as well as the political power and discuss with Foucault their semiotical structures.

The concept of biopolitics has infiltrated into the fields of anthropology, geography, sociology, political science, theology, legal studies, bioethics, digital media, art history, architecture and further research areas. It opens new political spaces beyond which transpasses the cultural institution towards hybrid structures of nature/technology mutations.

## Natural kinds in linguistics

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In this paper, I would like to analyze the types of phenomena that can be considered to be *natural kinds* in linguistics. I would like to explain why concepts like *noun* and *verb* are better candidates for natural kinds than, for instance, *word* or *language*. This paper continues my exploration of a biosemiotic approach to natural language analysis. I would like to show in this presentation that recent trends in linguistics converge with foundational principles in biosemiotics (e.g. experimental phonology, corpus analysis, typology) while other currents are inherently psychologistic and unscientific. I would like to show why a biosemiotic approach to linguistics is most likely to make meaningful contributions to cognitive science.

## Dark Romance: Necrosemiotic axiology and the semiotic life cycle

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In *The Symbolic Species* (1997) Terrence Deacon identifies human verbal language acquisition as the first evolutionary threshold where symbol use happens, with all the concomitant adaptive advantages it affords, but along with these advantages in this book and elsewhere he alludes to certain disadvantages that result from symbols. To describe these disadvantages he uses words like maladaptation, parasitism, cognitive penumbra, and other hyperbolic terms, all having to do with a decreased perception of sub-symbolic signs. Deacon is sometimes disparaged for his supposedly imprecise or incorrect use of the sign theory of Charles Peirce to defend his claims about symbols and their alleged disadvantages. The problem is not that Peirce should not be used in this way. The problem is that Deacon's Peircean model is too simple. In fact Deacon's claim about the possible disadvantages of symbol use can be reinforced with a closer look at the mature, turn-of-the-century Peircean sign model. This preserves the theoretical integrity of *The Symbolic Species*. On top of that, a detailed Peircean account of the eclipse of the sub-symbolic sign reinforces claims made in ecosemiotics, such as that symbol use negatively warps the human relationship to the environment, and that artistic modeling systems are better equipped to express environmental issues than more formalized or dominantly symbolic ones.

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## **The vocal repertoire of Tibetan macaques (*macaca thibetana*): a quantitative classification**

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Vocal repertoires are basic and essential components for describing vocal communication in animals. Studying the entire suite of vocal signals aids investigations on the variation of acoustic structure across social contexts, comparisons on the complexity of communication systems across taxa, and in exploration of the evolutionary origins of species-specific vocalizations. The genus *Macaca* has garnered considerable attention throughout the history of behavioral research on communication in non-human primates. Aside from sharing the basic ecological and social features of being semi-terrestrial and mainly frugivorous primates living in matrilineal multi-male and multi-female groups, macaques are the most geographically widespread and behaviorally diverse genus showing inter-specific variation unparalleled in any other non-human primate genera. These features make this genus ideal for investigating the evolution of communication, and an addition to the macaque vocal repertoire literature strengthens comparisons of phylogenetic, ecological, and social factors that drive vocal complexity. Here we describe the vocal repertoire of the largest species in the macaque genus, *M. thibetana*. Ad libitum acoustic recordings and behavioral dictations of behavioral contexts of 960 hours of data were collected in the mating season of August 2014 through January 2015 from 43 individuals. Post hoc validation through a principle components analysis summarized the 30 acoustic parameters we extracted from 534 call recordings and a discriminant function analysis correctly classified 88.8% of the calls to a priori categories. We identified eleven call types: *coo*, *squawk*, *squeal*, *noisy scream*, *growl*, *bark*, *compound squeak*, *leap coo*, *weeping*, *modulated tonal scream*, and *pant*. In comparison to the rest of the genus, Tibetan macaques uttered a wider array of vocalizations in the context of copulations. The harassment of copulations by all age/sex classes, including adult females, is unique in Tibetan macaques and may therefore contribute to the acoustic distinctness and usage of call types associated with copulations. High pitched tonal calls attract the attention of adults, and the highest frequency call, *modulated tonal screams*, emitted by harassing individuals may attract conspecifics and help disrupt the copulating dyad. A shrill high frequency female copulation call may also attract more individuals as the sound may propagate further than an atonal inhale-exhale grunt typical of female macaques. The vocal repertoire of Tibetan macaques contributes to the literature on emergences of derived species-specific calls in the genus *Macaca* with potential insights from social, reproductive, and ecological comparisons across species.

## **A constructive approach to mental misrepresentations in human and non-human minds**

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We want to show the relationship between Mark Bickhard's (2008) interactionist model of mental representations and rationality of agents (human and non-human) with mental disorder. In his model, Bickhard emphasizes the importance of system-detectable error. Mental representing should be then understood as constant process of constructing and re-constructing of mental representations. A cognitive system detects adequacy of its representations, confronting them with actions driven by them. The most general biological role of representational function is then self-maintaining system's organization.

Following Bickhard's model we will argue that system's detectability of the representational adequacy is a necessary condition for any kind of mental representations. Such approach has further consequences for the concept of rationality. Cognitive systems that can represent are rational because they can also misrepresent. No rational cognitive system is faultless. Following that, such cognitive impairment as self-deception, confabulation, hallucination in mental illness (like schizophrenia (Hirstein, 2006)), obsessive-compulsive disorder (Hur i in., 2012) and eating disorder (Baird & McKay, 2008)) are rational (Bortolotti, 2014). They help to preserve a cognitive system's organisational structure (Bickhard, 1989). What is more, such behaviors cognitive failures could take any kind of forms, not necessarily propositional (Bortolotti, 2014).

We will focus on the meaning of "misrepresentation" for non-human minds. Recent studies show us that mental illness isn't something unique for the people (Braitman, 2014). Mental disorder may be a better model for understanding the complex animal representation and misrepresentation. The idea of the misrepresentation for non-human will be concerned in Bickhard's model with its larger implications.

According to Bickhard's concept of function, mental representations are functional because they play an actual role for system's self-maintenance. Instead, we suggest that it would be more fruitful to assume hybrid concept of function that enrich actual concept of function of its etiology or historicity. We argue that understanding how a representational function evolved, so knowing also its biological history, helps to see how a representational function and cognitive errors can be adaptive. Furthermore, in Bickhard's original model some delusional representations, for instance delusion of reference (Kiran & Chaudhury, 2009), might be denied representational character because there is no way to detect error in them by the delusional subject. We argue that the hybrid account of function allows seeing them as partially dysfunctional representational processes.

## **The consequences of the foundational nature of autopoietic agency**

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Social constructivism is not enough if we want to include our material aspect of reality, mechanicism as well as system science and cybernetics have deep problems explaining how the emergence of experiential consciousness is possible. Even autopoietic bio-constructivism as well as codebiology lacks a phenomenological aspect. System science has an emergentist self-organizing theory, but does not seem to have means of going from the material to the experiential aspect of reality. Codebiology attempts to solve this by an emergentist view of codes, but cannot explain this new emergence of codes that creates new realities. But Peirce's semiotics has the advantage of being able include an agency interpretative dynamics in its view of reality. Peirce's semiotics is the only known evolutionary process philosophy that includes phenomenology, mathematic and logic in its metaphysical foundation and creates a partly empirical based epistemology. For Peirce logic is semiotic. Evolution is progress in living systems ability to fallible interpret their environment through abduction. This allows them to improve the viability of their Umwelt through reasoning and empirical testing in a primitive form of hypothetical deductive method. But Peirce also assign a type of agency to signs – especially symbols - which makes it possible to operate with agency as foundational in a way that is not possible in classical physics. Even in non-equilibrium thermodynamics like Prigogine's with its self-organizing capability a qualitative emergence theory for mind is not possible. Peircean semiotic pragmatism makes agency and interpretation foundational in its triadic paradigm, where the categories of Firstness, Secondness and Thirdness is founding a process view that goes beyond ordinary objective idealism, as it is based on an dynamic possibility ontology of emptiness that has much in common with quantum physics.

## **Biosemiotics and bruxism: what does tooth grinding have to do with sign processes**

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Bruxism is a habitual jaw-muscle activity characterized by clenching or grinding of the teeth, and/or bracing or thrusting of the lower jaw. There are two distinct circadian phenotypes of bruxism: sleep bruxism (SB) and awake bruxism, which are considered separate entities due to the putative difference in their etiology and phenotypic variance. The detailed mechanisms of the emergence and persistence of bruxism so far remain unknown. Most recent theories explain it with an altered regulation of certain pathophysiological or psychological pathways, possibly originating in the central nervous system. Some of the new research evidence regarding the causes of bruxism points to a fact that bruxism is probably a combination of genetic and environmental (GxE) factors. Most bruxism researchers and clinicians agree that an incomplete understanding and definition, an undetermined etiology and an unreliable diagnosis of bruxism often result in undesirable study designs, biased research evidence and inappropriate clinical management of bruxism. My hypothesis, which I argue in a doctoral dissertation titled *The social construction of bruxism*, proposes that the difficulties that accompany the clinical and research management of bruxism originate from the inadequacies and limitations of its methodological and explanatory medical model, i.e. the mechanistic *biomedical* model. I also argue that shifting to an integrative *bio-psychosocial* medical model, which fuses in its interpretations and management of complex disease phenotypes (like bruxism) both mechanistic biotechnological methodologies and up-to-date integrative theoretical paradigms like biosemiotics and epigenetics, would help eliminate many of these difficulties. In my dissertation I draw my ideas about the new interpretative and methodological possibilities of merging biosemiotics and epigenetics into bruxism management and theory from Pierre Bourdieu's sociological *habitus* theory. *Habitus*, viewed from the biosemiotic perspective, represents an innovative, anti-dualistic theoretical framework of an alternative bio-logics, that integrates biological, social and environmental dispositifs and dispositions in a unifying strategy and a general mechanism of co-evolutionary and coaptative eco-psycho-socio-biological structuring. It explains biological and social processes and phenomena through intelligible dialectic material and semiotic interactions and relations that have inherent formative, in-formative, functional and causative potentials. In my dissertation I use the biosemiotic theory as a theoretical trajectory between Bourdieu's *habitus* theory and epigenetics, which I articulate through a comprehensive comparison between the *habitus* theory and Jakob von Uexküll's *Umwelt* theory, and on the other hand through establishing epigenetics (*sensu lato*) as a biological and medical paradigm, whose basic principles are complementary to the basic postulates of biosemiotics. Since epigenetics (*sensu stricto*) also provides a methodological framework for investigating specific mechanistic GxE interactions, their involvement in bruxism justifies our application of epigenetics to bruxism empirically as well. I have presented these mechanistic associations resulting from our trans-disciplinary approach in an original article entitled "Epigenetics and bruxism: Possible role of epigenetics in the etiology of bruxism" published in *The International Journal of Prosthodontics*.

## What are the implications of a biosemiotic concept of information for the analysis of emotions in nonverbal communication?

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We know that there is synergy between nonverbal communication and language. Sebeok and Danesi (2000) posited that secondary modelling system (language) is grounded in primary modelling system (nonverbal communication), while McNeill (2005: 23) argued that gesture (one of the forms of nonverbal communication) and speech are co-expressive. However the kind of emotional insight and/or emotional value that shapes and is shaped by learning, is often considered only when 'coded' or verbalized (for example within the context of university education this is evident in the popularity of Personal Development forms, feedback forms, interviews, etc. which only collect linguistic data about students' learning experiences). Such an implicit yet nearly omnipresent methodological choice is often made at the expenses of any consideration of how emotional insights or value may instead be expressed, or even formed at root, through nonverbal communication rather than language.

As an ubiquitous and pervasive phenomenon, nonverbal communication includes perspectives on proxemics, posture and orientation, body movement, gesture, voice, facial expression. Yet the variety of approaches deployed in empirical studies in these areas seems to be structured alongside two polarized views, that is, according to whether nonverbal communication is seen as a phenomenon to be *decoded* or to be *interpreted*. The former approach (for example, Schouwstra and Hoogstraten 1995; Montepare et al 1999; Banse and Scherer 1996; Coulson 2004) is broadly concerned with coming up with a coding system of formal anatomical features of nonverbal communication. This coding system which provides 'better-than-chance accuracy' in decoding, is reliable, free of coding errors, free from observers' bias, based on context-free and simulated displays of emotions, and on standardized samples. On the other hand, the latter approach (e.g. McNeill 2005; Trumble 2004; Hall 1968; Ryan 2010) is fundamentally concerned with the nonverbal as a communicational form which carries meaning within a specific context and bears zones of indeterminacy according to the medium it relies on.

In this paper I will note how the fundamental difference within these two approaches rests on the conception of information they implicitly rely on, that is, *computing information* within the 'decoding' approach, and *semiotic information* with the 'interpretational' approach. I will thus argue how an explicit take on the nature of information may be suggestive of a new, biosemiotic framework for the analysis of emotions as expressed through nonverbal communication, which would lean on the interpretational approach but also extend it by means biosemiotics models of information. Such a framework would include notions of (a) *abduction*, (b) *environmental* constraints, (c) *physiological* constraints (d) theories of *error/distortion*, e) *observership*. This latter point, refracted by Brier (2008) from Second Order Cybernetics' constructionism (von Foerster 1973, Maturana and Varela 1980, Luhmann 1986), is particularly crucial as Copley notes that "the future of research in the sphere of biosemiotics will be enhanced by a greater understanding of 'observership'" (2010: 2045).

It is expected that an explicit take on the theoretical nature of information will bear practical implications for the analysis of nonverbal communication, particularly in regard with 1) the *contextualization* as opposed to the isolation of data, 2) the observational *richness* brought about by the individual perspective of the observer(s), instead than the strive for better-than-chance accuracy and finally 3) the need for a meaningfully *selective* rather than a representative sampling. These points will contribute towards the strengthening a biosemiotic qualitative science that emphasises value and meaningfulness, alongside truthfulness and accuracy, in the investigation of human nonverbal communication.



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## **Freedom, repression and constraints in biosemiotics**

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Human modelling as unique among the modelling of all the animals because it features both nonverbal and verbal communication (Sebeok 1988). Yet, in the development of this modelling, something must be lost with the movement to one mode from another, phylogenetically and ontogenetically. In the theory of natural selection, it is clear that what gets lost are the species, or species members, who do not adapt fit features to the evolving environmental imperatives. Biosemiotics, on the other hand, has been critical of the ruthless mechanism of the theory of natural selection. Contra neo-Darwinism, it posits ‘semiotic freedom. This semiotic freedom characterizes the scaffolding process in evolution, where the organism ‘builds’ on its relation to the environment. What happens on those occasions when one ‘choice’ is made by an organism over another or one set of scaffolding occurs rather than another? In the case of the phylogenetic development of communication it is clear that the ‘choice’ – exaptation – of linear speech for human communication was significant. By no means did it eclipse nonverbal communication; nor did it demote nonverbal communication to a subsidiary role in real terms; but it did ensure a bias towards the nonverbal and a disregard for it that effectively banished much nonverbal communication to a realm that is not conscious in the way that it was for our earlier hominid ancestors. A related fate can be seen with respect to ontogenetic repression of human nonverbal communication. In infancy, the child is almost solely reliant on nonverbal signs. Its Umwelt is attuned to verbal signs and such signs will certainly circulate there; but those same kinds of signs will not yet emanate from the child her/himself. Around 18 months, however, the child with an expected development rate will start to use speech and syntax in an elementary fashion, a development which is embedded in the remit of most public health systems that seek to treat impediments to infant development. With these observations in respect of human development in mind, this paper will consider the theoretical approaches in biosemiotics which suggest freedom of, repression within and constraints on (in Deacon’s 2012 sense) organismic action. The paper aims to stimulate discussion regarding which conceptions and terminology are most appropriate in this sphere.

**Breeding success between species belonging to genus *Serinus* and *Carduelis* (Aves: Passeriformes): The origin of a new species in captivity.**

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Here we assess the communicational behaviour, sexual signaling and breeding success of inter-species hybrids between different genus of passeriformes kept in captivity (Stresemann, 1923; Duncker, 1927). Our conclusions will be based on work done in the summer period, between September 2015 and January 2016, in Santiago, Chile. As part of a sequence of iterated back-crosses breeding of Mendelian law (Mendel, 1860). We bred a male Canary *Serinus canaria domestica* with two females' hybrids [F1 of subspecies of *S.c. domestica* (*Serinus*) with savage Black-chinned-Siskin *Carduelis barbatus* (Molina, 1782) (*Carduelis*), both of which belong to different genus of the Fringillidae family)]. The location where the back-cross species breeding and corresponding observations were carried out is a 4.45 m x 1.60 m room (glassed balcony, over the street level). We took care to keep the biotic and abiotic factors under control; specifically, incoming natural light, ambient vegetation and temperature. On the other hand, we fed the individuals appropriately and provided them with plenty of clean water to drink and get clean. In sum, the individuals were kept in a healthy environment. These female hybrids, the existence of which is, incidentally, unviable according to some literature, have successfully raised 3 independent offspring hybrid individuals (N=12) in artificial conditions. The results show that sister female's hybrids are indeed viable and can in fact produce dynasties of hybrids (Birkhead *et al*, 2003). On the other hand, the phenotypic traits of the plumage gave the ratio 1:1. The offspring were bred naturally by their parents and had an illness-free upbringing. None of the offspring presented malformations either. None of them died in captivity; the breeding success rate of the experiment is therefore 100%. Preliminary results and observations show that the new offspring of hybrids had better reflexes and mobility than the subspecies *S.c. domestica* (personal observation). They also presented better adaptability to the environment and more resilience to low temperatures, as well as, greater ability to quickly corporal movement on flight. We conjecture that these behavioural traits were transmitted down from the hybrids mothers, given that there is a closer similarity between the aforementioned traits to traits of these birds rather than of the savage species *C.barbatus* (pers. obs.). The hybrids' vocalization were quite similar to those of their parents, even the males' birdcall was similar to *S.c. domestica*, which has more variability than the savage species *C.barbatus* repertoire (pers. obs.). In addition, the breeding behaviour, the signals of sexual identity (Birkhead, 2002), the courtship's vocal repertoire of *S.c.domestica*, the submission signs and the copulation positioning of the hybrids have been faithfully passed down. By means of his vocalizations and his persecution at the females, the male bird successfully managed to attract the hybrid females and thereby to force them into estrus and copulation. We reported notice of the *S.c. domestica* male having a preference for one of the hybrids, which was the first one he copulated with. The phylogenic relations (Arnaiz-Villena *et al*, 1999; Zamora *et al*, 2006, and Zuccon *et al*, 2011), communication, body language, the congruence-conservation (Maturana & Varela, 1984), and the environment ("Umwelt": Uexküll, 1909) have been crucial factors in achieving the breeding success in captivity between individuals belonging to genus naturally living in very different non-communicated environments (Umwelt). We propose that, in this case, we are dealing with a new species, namely the product of a speciation by hybridation in captivity (Mavárez *et al*, 2006).

## Biosemiotics and the natural sciences: Framing or bridging?

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Søren Brier (2015) argues that “Peircean biosemiotics” should aspire to become new type of “interdisciplinary Wissenschaft” (see, Brier 2016). In his view, the field is to challenge the dominance of Galilean approaches by tracing living nature to interpretation and subjectivity (I&S). Brier argues that

- (1) Although information processing can be used to model mechanisms, these throw no light on I&S.
- (2) If biosemiotics is to understand I&S, it cannot rely on a methodology that centres on mechanistic models.
- (3) Rather, to come to terms with I&S, one must begin with a “deep ontology” or framework.

Brier also denies that I&S (and, thus, functionality) derive from organic coding (Barbieri, 1997). Far from *adding* to science, biosemiotics is a framing or ‘paradigmatic background’ that brings semiotics to science. Leaving ‘coding’ aside, I make two counter moves. First, I contrast mechanistic models with models of mechanisms. Second, I take an agnostic stance towards I&S. Instead, I use biosemiotic description of how cell-phones can alter interpretation and subjective experience. Accordingly, I argue that the results allow one to offer hypotheses about the evolution of functionality (and, perhaps, I&S). On this ‘weak’ view biosemiotics is a way of bridging (reports of) phenomenal experience with descriptions that can be formalised and thus used in the models of the natural sciences.

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## Extending the concept of behavior beyond animals: not only a terminological issue

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Understanding what is and what is not behavior is central to studying semiosis in non-human systems, because we can infer the presence of semiotic phenomena only from their behavioral manifestations. While whole scientific fields (e.g., biology) may flourish without agreeing on a formal definition of their subjects, undue extrapolation from disciplines such as mathematics and logics leads to the common misconception that a subject lacking a clear and unambiguous definition cannot be rigorously studied. This persistent belief is currently hampering the use of behavioral science concepts to study non-animal systems, since behavior is usually understood as involving active (and at best rapid) movements in the physical space, and as non-overlapping with development (ontogeny). A recently proposed majority consensus definition of behavior as “*the internally coordinated responses (actions or inactions) of whole living organisms (individuals or groups) to internal and/or external stimuli, excluding responses more easily understood as developmental changes*” (Levitis et al., *Anim. Behav.* 78:103-110, 2009), leaves aside the locomotion issue but emphasizes a clear demarcation line between behavior and development. The latter is generally acknowledged only as one of the factors shaping behavior, together with evolutionary, hereditary and environmental influences, in an *exclusive* “development of behavior” perspective.

However, studies in plants show that outside the animal kingdom development, movement and behavior can be inseparably linked. Plants, as sessile organisms whose cells are enclosed in relatively rigid cell walls, move through the physical space, slowly but surely, by growing – through extending existing organs and generating new ones, often in response to environmental cues. Plant post-embryonic ontogeny follows a species-specific algorithm rather than a body plan, is based on plastic use of repetitive modules, and is incessantly modulated by the environment and by individual experience. Thus, plant biologists often understand behavior as encompassing developmental plasticity, in an *inclusive* “development as behavior” perspective (Trewavas, *Plant Cell Environ.* 32: 606-616, 2009).

We attempt to reconcile these two perspectives by proposing a definition of behavior as “*observable consequences of the choices a living entity makes in response to external or internal stimuli.*” The word “choice” is used here in the sense of adopting one of at least two alternative fates, or trajectories, in the state-space available to the living being in question, including, but not limited to, movement (or lack thereof) in the physical space. By no means, however, does the use of this word either imply or exclude involvement of a mind or consciousness.

Besides of fine-tuning definitions, a certain shift in perspective may be needed. The existing overlap between behavioral sciences and physiology can be taken as a glorious example of peaceful co-existence of two disciplines addressing the same subject from two different angles, delimited by their methodology and perspective rather than by their subjects. Such a perspective is extensible also to the relationship between behavioral sciences and developmental biology. We believe that the recent plant investigations provide a sufficient justification for such a shift, which may help to make the behavioral science concepts and techniques applicable in fields outside their discipline of origin, including biosemiotics.

## Arbitrariness is not enough

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Arbitrariness in the genetic code is one of the main reasons for a linguistic approach to molecular biology. This concept has existed for at least last fifty years and it has never been explicitly questioned.

The genetic code is usually understood as a relation between amino acids and nucleobases. The mediated relation between amino acids and nucleic bases is proof of the arbitrariness in the genetic code, and therefore it proves that the genetic code is a real code (and therefore the name of *code* is not a mere metaphor). However, is it as simple as it seems to be?

Every mediated relation is arbitrary, but it is not said that an arbitrary relation between two entities is sufficient to create a code (language). The question is whether amino acids and nucleic bases have other qualities, besides arbitrariness, that characterise signs and their objects. The mediated connection between these two entities makes it tempting to consider them as signs and their objects. Nevertheless, this is the only argument and it is not sufficient for the statement that amino acids are meanings in the genetic code. It defines meaning only in that *it is connected indirectly to something else* (to nucleic bases). It lacks a convenient definition of meaning.

Semiotically, there is nothing wrong with a purely relational definition of sign and meaning in general. Speaking about the genetic code, this definition should be specified, for as much as it concerns a specific code.

We propose to define the meaning of the genetic code not only relationally (in relation to the expression) but also in terms of function (function of a protein as meaning). Even if the functional definition of meaning in the genetic code has been discussed in the field of biosemiotics, its further implications have not been considered. In fact, if the function of a protein represents the meaning of the genetic code (the sign's object), then it is crucial to reconsider the notion of the expression (the sign) of the genetic code as well.

In our contribution, we will demonstrate that the arbitrariness of the genetic code is still a term with unclear demarcations, since the very notion of sign in the genetic code is equivocal. We will show that the actual model of the genetic code is not the only possible and another alternative will be proposed.

## The biosemiotic glossary project: intentionality

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In 2014, The Biosemiotic Glossary Project was launched by the editors of journal *Biosemiotics* with the goal of collating and, if possible, clarifying the ways in which certain terminology is employed within the discipline. Designed to integrate the views of members within the biosemiotic community based on a standard survey, the Biosemiotic Glossary Project is “an enterprise that aims both to document existing biosemiotic term usage and to contribute innovatively to the theoretical discourse” about and underlying biosemiotics (Tønnessen, Magnus and Brentari, *in press*).

The first two entries in the Biosemiotic Glossary Project surveyed biosemioticians’ use of the terms “Agency” (Tønnessen 2015) and “Umwelt’ (Tønnessen, Magnus and Brentari, *in press*). For the third entry, I have decided to investigate how the term “Intentionality” is and may be used within the biosemiotic perspective.

As understood in the everyday sense of the term, *intentionality* refers to deliberate, purposeful action – “to have in mind as a purpose or goal” (Merriam-Webster) “volition which one is minded to carry out” or “ultimate purpose; the aim of an action; that for which anything is intended” (OED).

In philosophical and phenomenological terms, following Brentano, “Every mental phenomenon is characterized by what the Scholastics of the Middle Ages called the intentional (or mental) inexistence of an object, and what we might call, though not wholly unambiguously, *reference to a content, direction toward an object* (which is not to be understood here as meaning a thing), or *immanent objectivity*” (1874[1995]:88-89). More colloquially, this oft-used sense of the word *intentionality* refers to “The property of a thought or experience that consists in its being consciousness ‘of’ or ‘about’ something (MacIntyre and Smith 1982: xiii).

Biosemiotics, in its concern with explaining the emergence of, and the relations between, both biological ‘end-directedness’ and semiotic ‘about-ness’ (or what John Deely calls “being towards another” [2001:478]) in nature, would seem a fertile field for re-conceptualizing the notion of *intentionality*, and it is for that reason that I have spent the last few months soliciting from biosemioticians, their definitions and understandings of the concept of “Intentionality” from a biosemiotic perspective.

This talk will present some of the major findings of that research.

## **Language, languaging and man-made coding**

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The paper uses the work on languaging and the brain to pursue two major themes – the use of writing systems and face-to-face languaging. Separating the former from the latter, it first introduces Morse as exemplifying the interesting properties of man-made codes. It then contrasts the use of writing systems – with reference to the Roman alphabet in particular – with face-to-face languaging. Making and imagining vocalization draws on a multi-scalar set of bodily, emotional, and contextual constraints that are plainly biosemiotic; it is a real-time activity that draws on organizational resources of various kinds to achieve social action and co-action. By means of the use of specific kinds of skills that writing system allow humans to develop, those systems have a broader, more historical function of stabilizing and extending the ‘human ecology’ (or semiosphere) than fast real-time interaction. The paper intends to show that the act of mediated interaction – here, texting – neither conforms to the one nor the other. It, surprisingly, inhibits essential characteristics of both themes. While relying on skills for using writing system, the co-imagination of past vocalizations – ‘hearing voices – comes to the fore in an episode of texting. Arguing that languaging is in the brain, the example describes texting (and languaging) as an anticipatory act. This is discussed in relation to the foregoing topics.



## Mimetic relations between Hepatitis C virus RNA genome, tRNA and host defence mRNAs

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RNA viruses contain very small genomes. One of the strategies employed by these viruses is to mimic key factors of the host cell so they may take advantage of the interactions and activities in which the factors typically participate. The ability of viral mRNAs to mimic tRNA was first discovered more than 40 years ago after observing that the 3' end of the turnip yellow mosaic virus (TYMV) was capable of undergoing covalent linkage with amino acids catalyzed by valyl-tRNA synthetase (1). This and other plant viral RNAs were subsequently observed to be accessible to a battery of factors involved in other tRNA-related activities including the accessibility of bacterial RNase P (the tRNA precursor processing enzyme). Hepatitis C virus and related animal pestiviruses both possess an RNA genome and share a highly structured, non-coding region at the 5'-end of the genome. Using the specific enzyme RNase P, the presence of a tRNA-like structure in this region was demonstrated in HCV (2,3); the same structure was subsequently seen to be conserved in the animal pestiviruses (4). Recently, we identified interferon alpha mRNA as a specific substrate for this enzyme (5). The structure recognized by RNase P was characterized by classical enzymatic and chemical methods and its similarity to HCV tRNA-like motif is notorious. This tRNA-like region coincides with the functional signal “cytoplasmic accumulation region” (CAR) in interferon alpha mRNA. Our finding connects two fields of molecular mimics maintained a part: one the robust field of viral tRNA mimics, which is confined within the mechanisms of molecular biology of the cell (ie. replication and translation), the other that of mimesis between viral proteins and the immune system components which so much has contributed to understand viral persistence and pathology. The resemblance of HCV and INF mRNAs opens an unexpected door in terms of interpreting the activity of the clover-leaf structure of the hepatitis C virus, and generally for other viruses that possess these types of structure in their RNA genomes. This type of structural mimicry might be related to specific host mRNA species rather than, or in addition to, tRNA itself.

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## Foundationless objective reality

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We never really get past the stage of intuitive (or noetic) understanding. Nevertheless, a modern dream persists today that the discursive reason, intersecting with the cosmos, would alone be able to answer all (or most) questions about ontology and meaning. This dream has been the Great Hope for some centuries now, and it shows no real indication of waning. Even supposedly *postmodern* revulsions only sought to question or revise certain secondary modern convictions, but not many of its more fundamental commitments. Today we can see more clearly the futility of this hope that discursive reason and the bare cosmos themselves are sufficient to *resolve beyond indeterminacy* all ontological and semiotic questions. The cosmos itself, or rather the plane at which we intersect it, contains an ever present possibility of *shift*. Semiotics has in some way noticed this unavoidable shift in its emphasis that indeterminacy and multiplicity of meaning possibilities seem necessary for semiosis. The deeper issue is that the discursive reason cannot itself move beyond this possibility to *shift again*, nor does the cosmos give up answers which finally resolve indeterminacy regarding questions of ontology and meaning. Nevertheless, the dream of Proof persists – namely, that we will be able to discover some external form of bare, unsemioticized data which will itself compel a certain perspective of those that encounter it. The hope is that the active role of the semiotic agent can then be undercut and abdicated, that then the truth will “reveal itself” beyond semiotic activity, and that the possibility to *shift* will be removed (with perhaps the exception of the “mentally ill”). But this hope is unachievable, and we have made no real gains concerning its pursuit. The project of human inquiry pursuing this end has made progress on the technological front but has come no closer to ontological (what is it?) and semiotic (what does it mean?) questions. The discursive reason is able to divide and recategorize the cosmos *ad infinitum* because that is what it does. Unshiftable ontological and semiotic answers that seem to come by way of discursive inquiry are themselves semiotic phantasms. The category of data is a result of intuition or noetic grasping, and the category of evidence is semiotic – that is, evidence is a semiotic creation by which a relation is established to one thing (rather than another) according to some basis. That which cannot be shifted must be taken intuitively and axiomatically, just as an argument cannot be given for or against reason (or truth, or logic) itself without assuming its existence at the outset. We take what we intuitively grasp and then, through discursive (semiotic) processes, we build relational structures of meaning and ontology that always could be built differently. Modern scientific inquiry, which elevates this discursive reason and the ability of the cosmos to exceed itself, is in pursuit of a hopeless dream – the main result of which is greater technological reach to be categorically confounded by the same indeterminacy that confronted the unaided gaze of human experience. But this desire for the cosmos to transcend our limitation and to reveal truth from beyond our discursive eternal regress does hint to a conclusion it is time to face: unless it is possible for some revelation of knowledge to pierce into our bubble from outside of it, we can never have any knowledge that is not contingent upon shift. Revelation may not be possible or actual, but if it is not, our knowledge will always be nothing more than intuition and semiotic selections from shift. We would explore this situation at greater length.

## Umwelt as a Taoist female principle: Re-reading the *Tao Te Ching*

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The relationship between humans and their environment is one of the permanent concerns in ancient Chinese philosophical texts. The *Tao Te Ching*, or *The Sutra of Morals*, is the only surviving work of the Chinese philosopher Lao Tzu (c. 571B.C.E-471B.C.E). In a highly condensed but metaphorical language, it interprets human metaphysical contemplation of the universe in relation to his biological environment. In this paper, I will examine the *Tao Te Ching* in light of some contemporary observations in biosemiotics.

One of the central themes of the *Tao Te Ching* to be dealt with in this paper is the female principle of Taoist philosophy. In the first part of the paper, I will discuss Lao Tzu's concept of maternity by analyzing the metaphors used in describing the relationship between Tao and all kinds of creature; I will also try to explain how humanity is best accommodated in that feminine universe. Additionally, I will discuss the relationship between the female principle in Lao Tzu's philosophy and his topographical imagination, which might have inspired Julia Kristeva and Jacques Derrida because of its congeniality with the concept of "chora" (Kristeva 1980; Derrida 1995). From this point of view, the female principle in the *Tao Te Ching* not only has an affinity with humans' ecological niche, but also is rooted in female physiology.

The second issue to be addressed is the parallelism between the *Tao Te Ching* and the concept of "Umwelt" of Jakob von Uexküll. The paper will try to show that Lao Tzu is the forerunner of the "Umwelt" concept 2500 years before Jakob von Uexküll, by analyzing the conceptual homogeneity among *Umwelt*, *περιέχον* (periechon) and "embracing" ["bao"/抱](Chien 2007). I will also focus on the intersubjectivity between humans and their surroundings, with particular reference to Taoists' regimen in a natural setting, which has inspired Roland Barthes in forming his niche of writing (Barthes 1977). The paper will also try to show that "Umwelt" is by its nature a female concept, so is "writing".

Finally the paper will assess two phenomena: (1) the *Tao Te Ching*'s inspiration on modern cognition of human/environment, culture/nature structural couplings; (2) the joint influence of "Tao" and "Umwelt" on Heidegger's phenomenological understanding of humans and their existence (Heidegger 1927).

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## A feeling for what comes next

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Denis Noble in *The Music of Life* (2006) shows the fallacy of reductionism when it comes to biological understandings of the self. He concludes his book with the surmise that the self is a process rather than a thing (pp 133-134). In this respect it is like music which is also a process and is something that has to be appreciated as a whole.

We can extend and deepen this connection between music and non-reductionist biology by exploring the theme of temporality in relation to biological systems. It is a theme that is foregrounded in the work of another systems biologist, Robert Rosen, through his notion of anticipatory systems. Phenomenological accounts of temporality which emphasise proprioceptive and kinaesthetic intentionality (for example, Shaun Gallagher, Maxine Sheets-Johnstone), provide a way of theorising our experience of temporality consistent with Robert Rosen's notion of anticipatory systems, and with non-reductionist biological approaches to life generally.

The predictive or future-oriented aspect of anticipatory systems can be understood as a kind of knowledge – knowing what comes next, or knowing how to go on. There are affinities here with the problem in mathematical logic associated with Wittgenstein's notion of rule-following - a subject of debate in recent analytical philosophy. This is usually cast as the question of justifying our confidence in knowing how to follow a rule such as continuing a mathematical sequence when our knowledge is based only on past experiences.

But the appeal to Rosen's anticipatory systems means that the projectability involved in knowing how to go on is not always nor is it primarily, a matter of conceptual or explicit knowledge. It is better understood as involving implicit knowing or pre-cognitive *feeling* for what comes next. In this respect, it can be understood in terms of Peircean 'firstness.' Music, in its rhythmic aspects, exemplifies this experience of expectation as a 'felt' rather than a conceptual phenomenon.

The identification of music and temporality is a well-known feature of phenomenological and processual philosophies such as Husserl's and Bergson's. However this Peircean dimension of 'felt expectation' prompts a re-thinking of this equation – one which foregrounds music's rhythmic aspects, thereby giving a special place to movement not just as supplanting the cognitive and the conceptual, but as shaping it.

## A new perspective on the heterogeneous nature of situated, real-time languaging

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This paper shows how a distributed-ecological view of languaging is profoundly biosemiotic. On such a view, vocalization has been integrated, over evolutionary time, into most or all forms of co-action; it also slowly *becomes* so integrated over ontogenetic time. The functions of vocalizing are various, and include aligning the timing of one's activity with that of conspecifics, sharing and shaping specific aspects of experiences, and controlling ongoing activity. In serving these functions, vocal tract activity is constrained by several kinds of processes, on several timescales. One such source of constraint are articulatory synergies, coherent and repeating patterns of movement involving several articulators that can be flexibly strung together into highly structured streams (Fowler 2014; Fowler & Saltzman 1993; Goldstein & Fowler 2003). (For instance, "b" and "p" sounds are brief stoppages of airflow made by pressing the lips together while also vibrating one's vocal cords, or not, and keeping the tongue lowered; together, these movements are an "articulatory synergy".) Other sources of constraint are prosodic, as when pitch change is used to direct another person's vocalizing (e.g., to do "turn taking" or to question), or when attending is regulated by stress and emphasis (e.g., Cowley 1994; Cummins 2009; Port 2008). Vocalization is also organized by bodily effects of emotion (e.g., hormonal and other neurochemical changes, changes to breathing rate) and attention. And of course, literate speakers sometimes organize their articulatory activity with the intention that it should "match" a particular graphical form, in order to "utter" particular words or sentences.

This last point is of particular significance, as the study of "language" has historically been concerned with marking systems, and associated ways of talking about them (2005). Understanding language, then, is a matter of understanding at least (1) how the organizational flexibility of brains allows humans to engage with these various kinds of constraints, and (2) how graphical systems are used to reflect, and then to re-organize, vocal activity. These topics will be addressed by the other members of the workshop.

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## **Biosemiotics and cognition**

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Time has probably come to begin comparing term to term the description of an emotion or a feeling through the most recent achievements of neurobiology with the description that Saussurean semiotics can offer of the same emotion or feeling.

Strengthened by such a confrontation, semiotics can begin to formulate, from within its own theory, more and more precise questions concerning cognition for instance. Is it possible to describe or even to predict semiotically the process of the discovery of a new biological phenomenon (for example the manipulation leading to the isolation of a new neuro-mediator to be added to an already long list of biogenes amines including amongst others dopamine, noradrenaline, serotonin, histamine, adrenalin? Is there a semiotic transcription for the physiological role of pleasure?

The other way round, is it possible to describe biologically the very specific emotional experience attached to a major progress in cognition? Why is the mathematic discovery experienced as the result of an enchantment. How comes that so many mathematicians consider that they enchant the world with their theorems? How come that non-mathematicians experience a comparable feeling on having captured a part of the demonstration? How comes that a non-integrated demonstration resounds and is rejected as a musical dissonance even by a poorly trained mathematician?

Why and how are General Semiotics likely to develop in contact with such questionings? Biosemiotics will probably find the answer.

## **Semiotic individuation and free will**

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Gregory Bateson famously pointed out that in a way we do not have five fingers, instead we have four relations between pairs of fingers. For most practical purposes it is probably a good idea to focus on the fingers rather than the relations between them. But when life is seen in the perspective of "becoming" rather than in the usual perspective of "being" events such the 4 bifurcations of the embryonic hand plate beginning in week 7 of human pregnancy, is the important thing to focus on. The hand is only one small element in that lifelong process of becoming that I chose to call semiotic individuation. Like the hand with its five fingers semiotic individuation in general follows a pattern of an initial vagueness in form that imperceptibly freezes into more stable configurations that may then as elements enter into new higher-level patterns or configurations resulting in the multi-layered functionality of the human bodymind. One important consequence of this way of looking on our life-long ontogeny is that the conception of mental properties is rendered obsolete. We might of course loosely talk about N.N. being generous or impulsive, but these so-called properties are then only behavioral patterns not properties in the sense of basic personality traits. Our mental properties are vague and do not correspond to the meaning of the words we use in vernacular language. The presentation will attempt to clarify the concept of semiotic individuation and discuss the implications of this view of human life on the age old question of free will.

## From life to architecture - to life

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Uexküll's understanding of the organism-in-its-environment is, perhaps, the keystone to the inside-outside problematic. Peirce's sign model and semiotic theory emphasises how cognising, and the inside-outside synthesis, is a condition of sign interpretation. The principle of a difference, underpinning Bateson's ecological standpoint brings these two positions together to distinguish what has become the biosemiotic project. In this paper I would like to distinguish another individual, Frederick Kiesler (1890-1965); an Austrian-American architect, theoretician, theatre designer, artist and sculptor whose lifelong project was the unification of the sciences with art, through architecture. I suggest Kiesler provides a theoretical and practical precedent delineating a concrete bridge from the humanities to the biosemiotic project. Kiesler's central idea was 'continuity', through which he formulated the notion of 'endless space'; in contradiction to his contemporaries whose formulation of infinite space underpinned the modernist ideal. Kiesler's *Manifesto of Correalism* is the bridge, which I propose provides a concrete means for applying biosemiotic thinking in the humanities, most significantly in architectural design and theory.

The parallel between life and architecture is that they are both concerned with artefact making. Life is concerned with the generation and persistence of organisms, and architecture is concerned with the design, construction and maintenance of buildings. The distinction between the two is that the former is fluid (in the sense that the steps involved are intertwined) whilst the latter is static (in the sense that one stage is completed before the next discrete step commences). Kiesler identified this discrepancy (between how nature and humankind builds) stating: "Nature builds by cell division towards continuity whilst man can only build by joining together into a unique structure without continuity".<sup>1</sup> The emphasis, behind Kiesler's distinction, is that architects tend to make things through brute force (connecting parts together to form a whole) whereas nature tends to produce through a process of continuous construction whereby parts merge, overlap and conjoin one another. Kiesler strove to define an approach to (architectural) design that bridged this gap.

In my presentation I seek to illustrate the correlation between Kiesler and the biosemiotic project, and to propose how this coupling establishes a framework leading to an architectural-biosemiotic paradigm that puts biosemiotic theory at the heart of cognising the built environment, and offers an approach to shaping the built environment that supports (and benefits) human, and organismic, intelligence.

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<sup>1</sup> Frederick Kiesler, "On Correalism and Biotechnique. A Definition and Test of a New Approach to Building Design," in *Architectural Record* 86:3 (September 1939): 67.



## **The semiotic life of cats: a journey into the feline mind**

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The science of ethology put foundations for our understanding of animal behavior. Fathers of this discipline, Niko Tinbergen and Konrad Lorenz, gathered immense empirical findings about the lives of animals through active interaction with them. Yet, it seems as if their neo-Darwinian theoretical framework disabled them to see animal minds as active representational areas. The emphasis on the functional aspect of every behavior and underestimation of semiotic activity subsequently led to degeneration of the field to highly economic approaches of behavioral ecology (cf. Mitchel et al. 1997).

In this paper, we will build on Lestel's critique of classic ethology and make use of his bi-constructivist approach to ethological studies. In an opposition to classic ethology, Lestel refuses to categorize actions of animals into limited behavioral ethograms. Activities of animals do not follow just survival and reproductive objectives, they constitute genuine expressions of their individualities. Whereas common biological research wants to determine species-specific capacities that would firmly belong to all individuals under consideration, bi-constructivism is focused on inventing situations which can lead to unexpected actions of a singular animal. One needs to work with the animal to find out about its capacities rather than objectively describe its performance (Lestel 2011, p. 88, cf. Jaroš 2016, forthcoming in *Biosemiotics*).

Although the bi-constructivist approach is problematic for the study of wild animals, it is very promising as far as domestic animals are considered. Interactions between an observer and an animal run on the daily basis so the latter is less likely to react by a prompt flight. The convergence between *umwelten* of the man and domestic animals has led to a high degree of cohabitation and a shared communication channel (cf. Kleisner and Stella 2009).

We will apply bi-constructivism to model *umwelt* of household cats based on cat-cat and human-cat interactions. Our attention will be focused on three domains that are most clearly exposed by the signifying activity of cats: a) use of space (classic meaning of territory has to be redefined since most of interactions between cats are friendly), b) body postures and facial expressions (other mental states than aggression and fear must be considered), and c) significance of play (according to Burghardt 1997 and Tonnessen 2009, animals with playful *umwelten* necessarily display rich semiotic activity).

## Prions: a missing link?

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*“The living individual is a system of individuation, an individuating system and a system individuating itself; internal resonance and the translation of the relation to itself into information are in this system of the living.”*

Gilbert Simondon

In our recent contributions to biosemiotics we have often referred to Simondon's Theory of Individuation, which offers a framework for the process of individuation that corresponds to the “genesis of everything”, comparable to the Peircean cosmogony where nature takes habits. As an integral part of this theory, one also needs to mention Simondon's reformulation of the cybernetic (and somewhat problematic) notion of information, as well as his notion of “internal resonance”, which have crucial implications for biology and biosemiotics.

In this study, our central motive is to investigate the link between the physical and vital modes of individuation via the Simondonian reformulation of information, in an attempt to account for the emergence of semiosis, and particularly that of the genetic system. While doing so, we will focus on the phenomenon of “prions”, which first came to public attention several decades ago as pathogenic agents that cause infectious and severe neurodegenerative diseases in mammals. The discovery of pathogenic protein isoforms and the formulation of the “protein only” hypothesis, which states that a stable, abnormal conformation can propagate as a chain reaction forcing other, native molecules to acquire this conformation, was ground-breaking. However, after many years of research, today the situation is much more complicated than being restricted to mere pathogenesis. More recent and better fitting terms such as “prion-like mechanism” (PriLiM), or “prion-like protein” (PriliP) have emerged emphasising the gradual and broader nature of the phenomenon.

Looking from a Simondonian perspective, we suppose that life and semiosis are co-emergent, and suggest that one should better look for the emergence of the earliest signs in evolution at the level of physico-chemical individuation of macromolecules, for which Prion-like Mechanisms (PriLiMs) can be considered among plausible candidates. This is because at the intermediate order of magnitude of self-templating macro-molecules there exist alternative regimes of information (in Simondonian sense) due to the topological conditions that canalise and restrict the thermodynamic forces. In effect, here one can start talking about the system's “choices” and the possibility of proto-semiosis, without necessarily implying conscious decision making.

## **Fear not – socialization of captive wolves**

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Wolves give rise to controversy not only in the wild but also in captivity. Due to their genetically inherited fear of humans, wolves in captivity are notorious for persistent escape attempts, self-destructive behaviours, stereotypical behaviour and over-all suffering. Socialization of wolves with humans makes the animals more suitable for living in captive environments by reducing their fear of humans. Although proven effective, it is still a widely unknown and often misunderstood method of improving animal welfare for captive wolves.

In this paper, a semiotic approach is used to explain the essence and proper methodology of socialization of wolves with humans for animal welfare purposes. Emphasis is put on understanding the changes in the animal's Umwelt and in the human–animal relationship. The interdisciplinary theoretical contribution will be supported by Laura Kiiroja's practical experiences with socialization of wolves in USA and Germany, and by Morten Tønnessen's studies of wolf socialization in two Norwegian zoos (Langedrag mountain farm and wildlife park and Polar Zoo). Additionally, Kiiroja has conducted semi-structured interviews with world-recognized experts.

The study explains how proper socialization aims to change the human's significance in the animal's Umwelt from enemy to social partner. This requires social human-imprinting, and using consistently positive methods of taming and handling. In fact, using aversive techniques, such as dominance theory and punishment, damages socialization and results in dangerous situations. Working "on animal terms" and establishing effective inter-specific communication is crucial for avoiding conflicts and maintaining positive and healthy relationships. The authors suggest that a zoosemiotic approach complements more mainstream ethological knowledge in human–animal interactions and is capable of advancing animal welfare as well as give zoo visitors more realistic experiences of wolves.

The pros and cons of socializing captive wolves will be analysed. Animal welfare will improve with more opportunities for enrichment, less stressful effect of visitors, and better veterinary routines and husbandry practices. Avoiding suffering caused by constant fear enables the animal to display a quite complete species-specific behavioural repertoire. This is a benefit for behavioural research on captive wolves. Additionally, seeing the wolves in close proximity or interacting with them triggers empathy and interest in visitors, and this may contribute positively to support for wolf conservation. On the downside, zoos and other facilities keeping socialized wolves should be aware of the possibility that visitors might misinterpret wolves as potential pets, and adjust their education program accordingly. The management of these facilities should furthermore invest in educated wolf personnel, to be able to meet the requirements of proper wolf socialization.

## On the functionality of semantic organs

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There are various approaches to biological functionality: the etiological concept of function (Neander 1991), the causal role function (Amundson and Lauder 1994), and the organizational approach to function (Collier 2000). Within functional morphology, inferences about a function of a trait are traditionally based on the instrumental metaphor. The heart is the pump, the claws are tongs, and the giraffe's neck is a vertical lift. Nevertheless, biologists often talk also about the warning function of various animal color signals, vocalizations, calls etc. The question is: how is functionality established within these epi-somatic aspects of organisms?

The etiological concept of function, which is pervasive in evolutionary biology, explains the function of a trait as the effect for which this trait was selected by natural selection in its evolutionary history. But this explanation is incomplete. Many exposed surfaces of organisms were secondarily coopted for different purposes and subsequently optimized for communicational function. Traits must be first functional and then they can be further selected. Within biosemiotics, the concept of function has been extensively elaborated in relation to autonomy (see e.g. Collier 2000, 2004). In this perspective, autonomy is a condition to functionality and function ultimately serves autonomy. A trait is functional if it contributes to autonomy. No interpretation by an exo-somatic subject is needed to keep a fin paddling in a fluid medium or hearts beating and pumping the blood to vessels (however, a kind of auto-control and medium-structure feedback is always present). Still, the same cannot be said about functioning of semantic organs.

Semantic organs were defined as quasi-independent (semi-autonomous) entities whose autonomy is significantly co-determined by the meaning attributed to them by animal interpreters (Kleisner 2015). We argue that functioning of semantic organs is critically dependent on other subjects' perception and interpretation within a particular eco-semiotic consortium. We can thus distinguish between biological functionality, where the activity of external subjects plays no significant role, and functionality which is existent due to the subject-specific interpretations of epi-somatic aspects of organism. Using the empirical evidence from our own research we discuss the evolutionary and theoretical consequences of epi-somatic functionality.

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## Unsolved problems in biosemiotics

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“As long as a branch of science offers an abundance of problems, so long is it alive” (D. Hilbert, 1900). Together with Claus Emmeche and Don Favareau, we attempted to formulate a list of unanswered questions of biosemiotics when the first issue of the journal *Biosemiotics* was launched. Big corpus of biosemiotics publications (8 volumes of the journal and over ten volumes of books in the series *Biosemiotics*) has appeared after that, inviting to review and reformulate the unsolved problems again. This can be done in the context of main unsolved problems of biology as seen in these days (e.g., Dev 2015).

In biology, the questions that can be best answered by semiotic models are especially those concerning the processes of communication or phenomena of intentionality. Accordingly, biosemiotics has been able to provide clear solutions to some problems that have communicational mechanism at their basis: why species? why symbiosis? why sex? (cf. Sherratt, Wilkinson 2009). The biosemiotic problems that still require much work include, for instance, the following ones: what are the principal mechanisms of organic needs? what is the correspondence between the types of semiosis and mechanisms of learning? what are the simplest mechanisms of semiosis?

This presentation focuses on recent steps in solving the problem of meaning-making.

(1) The mechanism of meaning-making itself; as the mechanism of making qualisigns, is this equivalent to ‘the hard problem of consciousness’ — the mechanism of making qualia (since quale or qualisign — as Peirce defined it — is just the simplest type of signs)? We attempt to prove that the natural appearance of logical conflict is almost equivalent to this mechanism.

(2) Role of evolution; could a sign relation be a product of natural selection? Here the answer tends to be (mostly) negative (because reproduction of organisms is mostly not required for establishing or change of sign relations).

(3) Delayed feedback; how can temporally separated events be associated in a sign? If a new sign relation can only integrate cognitive events that occur in the subjective present (i.e. at the time window in which the sequentiality of events is not yet established), then representation via memory is required.

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## Umberto Eco on biosemiotics

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Devoting this presentation to Umberto Eco (1932–2016), we intend to emphasize that the impact of his work on the semiotic theory in general should be taken into account also in the light of biosemiotics development. On the basis of several conversations and our longer interview with him in January 2012 in Milan, we are going to analyze Eco's opinions on such questions as:

- (1) his intellectual relations with Thomas Sebeok and his views on zoosemiotics;
- (2) his attitude towards such "classics" of modern (bio)semiotics as Charles S. Peirce and Ferdinand de Saussure;
- (3) his comments on the biosemiotic work of Giorgio Prodi;
- (4) the concept of semiotic threshold;
- (5) the concepts of sign, iconicity, and cognition in the general context of (bio)semiotic studies;
- (6) the problems of using the notion of code by biosemioticians;
- (7) the notion of progress and its relevance for biosemiotics;
- (8) the connection of biosemiotics with the contemporary ecological problems;
- (9) classifications of sciences and the place of (bio)semiotics in them;
- (10) the definition of biosemiotics itself;
- (11) the importance of dealing with general semiotics, and with difficult problems altogether.

Also, we note the evolution of Eco's views, while he says, for instance, in 2012: "Now I would agree more with, say, the Sebeok side in that it is [...] important to study the way a dog perceives the world or the way in which cells recognize each other."

**Embodiments of interaction: dynamic mechanisms**

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This paper approaches the basic problematic of biosemiotics – construction, coding and communication of intentional events in living systems – in the context of radical embodied research on (human) cognition and brain functions. We are primarily interested in theoretically characterizing what are the properties of biological processes mediating cognition that enable them to flexibly and rapidly couple widely distributed resources across the environment, body and neuronal systems into task-specific “devices“ that are suited for satisfying the momentary adaptive and behavioral requirements of agents (including those traditionally associated with high-level cognitive computational, representational and communicative functions) (Wilson et al 2015; Bingham 1988). Assuming an embodied, enactivist approach to human cognition and neuroscience, as currently explored in a number of frameworks, we ask if common denominators can be found between the notions of coding, information, context and meaning as these are implied across different time-scales and levels of analysis (neurophysiological, psychophysiological, social). We focus in particular on the concepts of functional systems and synergies as possible candidate units for the integrative activity of organisms across scales and levels, and in the light of current research, trace the development of respective concepts in the traditions of earlier systems physiology and neuroscience (Anokhin 1968; Bernstein 1984; Ukhtomsky 1978). It is proposed that drawing on these traditions may help to ground an account of multi-layered mechanisms and inter-level dynamics inclusive of ecological, bodily, cognitive and neural resources (Dotov 2013), and thereby to move closer to an integrative account of embodiment. These theoretical considerations will be exemplified by empirical psychophysiological studies of functional systems dynamics in the context of real-time interactions in socially naturalistic, enactive communicative processes during the oral presentation of university term exams (Pavlova 2016, 1988).

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## **Tectonic indexicality and architectural semiosis**

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A work of architecture occupies a delicate position between functional performance and production of certain meaning and experience. The design of architecture becomes stifling when an architect attempts to harmonize the two facets. Modernist architects argued that a building should express materiality and assemblage in the most direct, “honest” way without embellishment. This view suggests that architecture should be designed so as to demonstrate the logic and efficiency of materials and assembly, the *techné* as embodiment of Aristotelian causalities. Postmodernist architects insisted that a building consists of “signs” that are applied to functionally generic structure. This view suggests that the meaning of architecture depends on the cultural context and architecture must augment the legitimacy of the given cultural discourse. As such, architecture may be made to express many different meanings while the fundamental technics remain the same in each instance.

In this paper, I will describe a tectonic-indexical approach to the design of architecture. I will first approach Peirce’s triadic sign system (icon, symbol and index) and its application to architecture. Next, I will discuss and link together indexicality, extra-somatic construct and tectonic aggregation in the context of architectural semiosis. In the process, I will argue for the view of architectural work as “instantiation” of semiotic assemblage that is driven by the intimate combination of tactility and algorithmic abstraction that epitomizes today’s apparatus-centric semiosis.

In the process, I will demonstrate how architecture can be designed in a symbiosis of tactile and visual composition specific to the tooling and assembly of materials and forms, and how such construct opens up to new potentialities of producing meaning in architecture. I will conclude the paper with a speculation of a new environmental criticality. On a larger context, I foresee the post-human semiotic architectural composition in which material ontologies of human-specific culture take a new turn.



## Talks with my elephant: on semiotic transfer

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Historical tales as well as actual records report the transfer of meaningful patterns for which a scientifically accepted base is not yet given. How may such 'Rare Normal Phenomena' (RNP), be accounted for, as for example ESP? Quantum theory offers the concept of 'entanglement'; Bell's theorem permits shared 'fates' of twin photons irrespective of distance. Does that help to explain the transfer of meaningful patterns? Their origin, quality, specification, constancy, evolvment?

1. Biosemiotic signs constitute meaning encoded in *patterns*. Patterns substantiate via physical/ chemical substrates and correlates. All known physical media – as matter (sound), electro-magnetic, chemical media, bio-photons – as carriers might be involved. These only? R. Gebbensleben (2010) provided evidence of an additional matter-medium in about 0.5 – 8 THz; Hypersonics (HS). Perceived by the human nervous system, HS acts as physical substrate. Ubiquitous HS fields transfer and store vast amounts of highly complex (biosemiotic) information.

How is semiotic information coded/decoded in life systems? Above the physiological cell level, biosemiotic information cannot sufficiently be analysed by physical scales and mathematics. It is acknowledged from the actual impact. - The answer should imply the biosemiotics of human *mental constructs* and *social behaviour*. –

2. *Rhythm* and *Resonance* constitute Life. Experiments suggest that EM and HS act as transfer media and as substrates for semiotic structures. Upon which form base semiotic information patterns are built; which are their correlates, substrates, processes; syntax and semiosis? R. Sheldrake proposes 'Morphogenetic Fields', carrying 'Morphic Resonance'. ('The Nature of Formative Causation' (2009)). HS research underpins the concept physically. Morphogenetic and HS Fields open options to understand (bio-) semiotics in the wider evolutionary and transdisciplinary context. However, basic epistemological stances implied are not yet generally accepted.

3. Patterns involve the language of *Forms* as semiotic substrates. Which rules do patterns obey when forming, in particular into *pictorial* forms as e.g. in geometrical *symbols*? Are there alphabets; a syntax, sign elements? How are complex symbols constructed, for example in Shaman shields?

4. These overarching queries emerged when conducting simple experiments investigating semiotic phenomena. Research relied upon controlled *mental methods*, using the brain as transducer. They were encouraged by 'rare normal' mental capacities and intensive, systematic inquiry of the underlying physics/physiology, supported by training and practice learning. C.G. Jung termed the semiotic realm the 'collective (sub-un-)conscious'; its existence physically substantiated by HS research and the morphogenesis concept. Both point to a semio-sphere within the biosphere. - Actually, worldwide ethnic field research, lectures (on innovation) at the Indian Entrepreneurial Institute etc. stimulated studies in Asian cultures and religions, mainly, Buddhism and Hinduism. The Elephant and consecrated figures of Buddha and Hindu deities were analysed in question and answer. Conversations were mediated by the realms of collective (sub-) consciousness (C.G. Jung), the HS and Morphogenetic Fields. Introspection (Wundt) and experiential case based intuition helped to formulate concise questions. - For such research, G. Bateson recommended non-rigorous methods. Methodical rigorosity has been secured by systematic questioning, guided perception, interpretation and evaluation of answers; validated by cross-checking and related practices. A theoretical background is given by the authors studies into systems based Models of Life, into Transdisciplinary Evolutionary models, Systemic analysis; into Socio-

cybernetics, epistemology (Science II, cybernetics). Concluding: Devices designed and experimental practice application – after some helpful failures – have been successful.

The paper continues investigations into interspecies communication and into communication between life systems and matter; demanding appropriate inquiry methods. It suggests a pensive insiders/ outsiders approach to a research topic extending the hitherto agreed rules of the Science I. Research into biosemiotic fields may open new vistas into the complex roles of biosemiotics for Life itself.

## A typological approach to environmental signs with an emphasis on their underdeterminacy

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Semiotics has put a lot of attention to conventional signs but has generally overlooked characteristics and types of natural signs (Sukhoverkhov 2012) or environmental signs, understood here as signs that humans and other animals encounter in the natural environment. Environmental signs relate to the concepts of signification (Nöth 2001), indexicality (Peirce, EP 2:9) and symptoms (Sebeok 2001) and they can be exemplified with the number of environmental processes: animal tracks and traces, signs of seasonal change, manifestations of many biological process (erosion, forestation), ecological codes (Kull 2010), etc.

In this presentation I will propose a typological account to analyze environmental signs. The typology will be based on connection between representamen and object and their particularity or manifoldness (based on Morris 1971). More specifically, the bases of typology are: 1) type of attachment of the representamen and the object; 2) accessibility of the sign relation to the interpreter; 3) particularity of the representamen; 4) particularity of the object. These criteria are not exclusive to each-other but create eight possible combinations that can be further described and analysed as distinct types of environmental signs.

The typological analysis indicates that in many environmental signs either representamen or object are manifold or imprecise; or that their connection is not fully accessible for the interpreter. Therefore environmental signs are often underdetermined and lack consistency for solid interpretation. This makes environmental signs open for broad space of possible interpretations and lay ground for many secondary semiotic process. The presentation discusses the roles of such underdeterminacy for animal communication as well as for human cultural semiosis.

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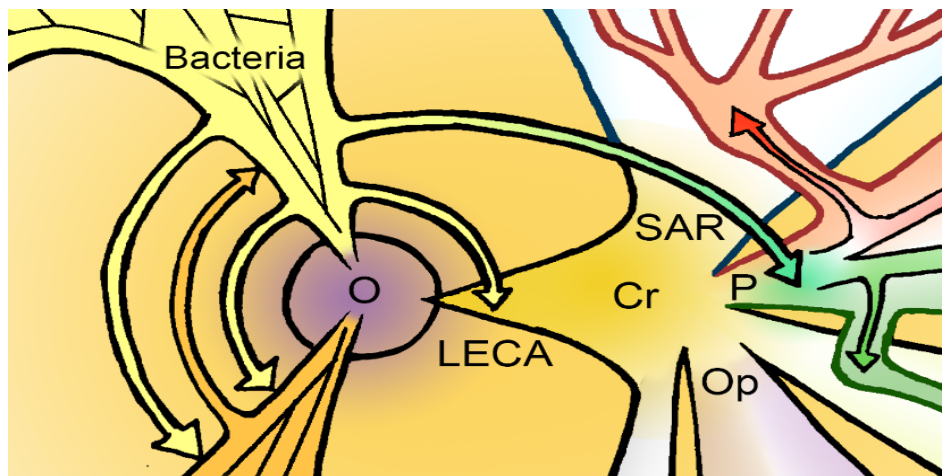
## Meanings in biosphere: we have never been dead and we have never been individuals

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On the last Gatherings in Biosemiotics in Copenhagen 2015, one of us (AM) ended his contribution by the following diagram (see picture below). The message of the picture points out that *all* different lineages of living beings sprouted from a common original biosphere, hence they are heirs of then established “ways of living”. That means that living activities of one lineage (be it metabolites, feromones, and other signals, display, coding rules etc.) may be understood in other lineages as *signs* (or even intended as such). What *meaning* will be given to such signs is, of course, a question of the state, memory, experience, and evolutionary history of the acceptor lineage in general, and individuals in particular.

In the first part of our communication, we would like to give examples of such mutual understanding (or misunderstanding) in evolution, leading to complicated biospheric symbiotic and symbiogenetic networks. In the second part we give an account of contemporary achievements within a research of holobiotic interactions, and illustrate such interactions on casual studies. Our microbita seem to influence our development, health or even mental well being in much greater extent that we ever thought. Disrupted relationships (*disbiosis*) with microbial part of ourselves supposedly lead to various autoimmune diseases, depression, autism or various metabolic disorders. Microbiota also represent another part of epigenetic inheritance as major part of symbiotic bacteria is transferred from the mother to the newborn baby horizontally (surprisingly even to the developmental fetus through the placental barrier yet during pregnancy). Without such inherited information the baby’s health can be negatively influenced as well. Such mutual, symbiotic evolutionary history strongly undermines the overestimated concept of the gene within evolutionary and developmental studies and also the concept of our human, biological individuality. Such interactions are thus a very fruitful source of inspiration for biosemiotic studies.



## Meaning generation for constraint satisfaction. An evolutionary thread for biosemiotics

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One of the main challenges of biosemiotics is ‘to attempt to naturalize biological meaning’ [Sharov & all 2015]. That challenge brings to look at a possible evolutionary thread for biosemiotics based on meaning generation for internal constraint satisfaction, starting with a pre-biotic entity emerging from a material universe. Such perspective complements and extends previous works that used a model of meaning generation for internal constraint satisfaction (the Meaning Generator System) [Menant 2003a, b; 2011].

We propose to look at such an evolutionary thread for biosemiotics in three steps. The first step presents the proposed emergence of a pre-biotic entity as a far from thermodynamic equilibrium volume constrained to maintain its status [Menant 2015]. Such constraint dependence introduces natural links with the MGS and with teleology. It also introduces perspectives for evolutionary origins of agency, self, and autonomy, coming in addition to other biosemiotic perspectives [Tønnessen, 2015]. The next step recalls the MGS as being a system approach linking the agent containing it to its environment and bringing to the agent a control from within. We apply the MGS to animal life. Relations with the Umwelt, with constructivism and with the Peircean triadic approach are highlighted.

The last step of the thread brings us through the evolution of life up to humans where specificities related to human mind have to be taken into account. Among them is self-consciousness, a key contributor to human mind for which an evolutionary scenario is available [Menant, 2014]. We link that scenario to the evolutionary thread because it introduces specific human constraints and is based on the evolution of meaningful representations.

A conclusion summarizes the steps of the proposed evolutionary thread. More work is needed on that subject. Possible continuations are introduced.

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## Is empiricism empirically false? Lessons from early nervous systems

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The recent work on skin-brain thesis (de Wiljes et al. 2015; Keijzer 2015; 2013) suggests the possibility that there is an empirical proof that empiricism is false. Keijzer suggests that early animals need no traditional sensory receptors to be engaged in cognitive activity. The neural structure required to coordinate extensive sheets of contractile tissue for motility provides the starting point for a new multicellular organized form of sensing. Moving a body by muscle contraction provides the basis for a multicellular organization that is sensitive to external surface structure at the scale of the animal body.

In other words, evolutionary speaking, the nervous system evolved for action, not for receiving the sensory input. So, in other words, sensory input is not required for minimal cognition; only action is. The whole body of an organism, in particular its highly specific animal sensorimotor organization, reflects the bodily and environmental spatiotemporal structure.

The skin-brain thesis suggests that in contrast to empiricism that claims that cognition is constituted by sensory systems, cognition is constituted by action-oriented feedback mechanisms. Instead of positing the reflex arc as the elementary building block of nervous systems, it suggests that endogenous motor activity is the crucial part of a cognitive system.

In my talk, I will discuss the issue whether the skin-brain thesis and its supporting evidence can be really used to overthrow the main tenet of empiricism empirically, by pointing out to cognizing agents that fail to have any sensory apparatus.

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## Intra- and interspecies communication in urban environments

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The urban population accounts for more than half of total global human population. Recent views on urban planning are strongly inclined towards integrating more nature to the cities (e.g. Beatley 2010; Birch 2008) in an attempt to re-naturalize some areas; green corridors are created, community and roof gardens are planted, new parks are established. It is only natural, that given these trends a lot of wild species of small mammals, birds, insects etc. have also found their way to the urban environments and settled in the cities. By welcoming the re-naturalizing of cities, people are more open to sharing the urban environment with other animal species (although, more so with some species than others (e.g. Donovan 2015)). Thus, a lot of attention is paid to human health and other benefits that stem from interacting with nature and other species in densely populated cities. However, there is much less consideration of how other species' intra- and interspecies communication is affected by the peculiarities of urban environment and constant presence of humans as communication partners.

This paper serves as a preliminary inquiry into intra- and interspecies communication in urban environments — with species other than human in its main focus. Relying on ecosemiotic approach (e.g. Kull 1998; Farina, Belgrano 2006), the general relations that humans and other species have with urban environment are outlined; secondly, it scrutinized what species and why are finding their way (back) to urban environments (also, which species are welcomed and why); and the major part of the paper will concentrate on zoosemiotic analysis (e.g. Uexküll 1982; Martinelli 2010) of the differences in animals' intra- and interspecies communication that have risen due to the nature of urban environments. Illustrative examples are brought of how humans facilitate and hinder other animals' communication and how people themselves are considered as communicative partners by other animals.

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## **Molecular information theory: a common ground between bioinformatics and biosemiotics?**

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The fields of biosemiotics and bioinformatics might seem to have a common goal: trying to make sense of, or find meaning in, biological systems. However, as a bioinformatician, I have had difficulties finding any points of contact between biosemiotics and my own field.

In 2015, Terrence W. Deacon wrote a manuscript entitled “Steps to a science of biosemiotics” as a draft for discussion at a workshop named “From Information to Semiosis” at University of California, Berkeley. In that text, he argues that the “foundational principles [of biosemiotics] can be made consistent with well-established principles in biology, chemistry, and physics.” This “re-grounding” of biosemiotic theory on natural science takes its starting point in the theory of information as formulated by Claude Shannon in 1948. This might seem an odd choice, since Shannon's information theory is explicitly not about meaning. However, accounting for the semantic aspects—meaning and reference—according to Deacon “... requires showing how the concept of entropy (as it is differently defined in thermodynamics and the information sciences) can be used to explain the relationship between information, meaning, and work.”

This is, to me, the point where biosemiotics and bioinformatics could meet. The bioinformatician Thomas D. Schneider of National Cancer Institute at Frederick, Maryland, has been working on Molecular Information Theory since 1986 (before the term “bioinformatics” was even coined in its present use). Here, he follows Shannon in defining the amount of information in a binding site on a collection of nucleotide sequences as the decrease in uncertainty (Shannon entropy) encountered when finding the correct binding site. By using both mathematical derivations and empirical observations, Schneider and various coauthors have been able to show many interesting aspects of the relationship between entropy, information, and work. For instance, the information which is transmitted to future generations turns out to be just enough to specify the phenotype; the rest is erased by noise (random mutations). Furthermore, the minimum amount of work done by a protein in order to bind to a nucleotide site can be calculated from both the second law of thermodynamics and from Shannon's channel capacity equation, yielding the exact same expression.

Although Deacon does not cite Schneider, his work could, in my view, be instrumental to Deacon's project. Combining information theory, thermodynamics, evolutionary theory and biosemiotics, one could say that the reference (proximal object or proto-object) of a biological sequence (sign vehicle) is its molecular role, e.g. the binding of a protein; while the meaning (ultimate object) of the sequence is its biological function, which is favoured by natural selection in the environment of the organism.



**Biosemiotics and phenomenology: Erwin Straus, phenomenologist or biosemiotician?**

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In this paper we will discuss the relevance of Erwin Straus' philosophy for biosemiotics. Erwin Straus (1891-1975) is essentially known as a psychiatrist and a phenomenologist. In his main book, *Vom sinn des sinne* (1935), he tries to show that perception is always connected to meaning. Indeed, Straus' philosophy is an attempt to describe the appearance of meaning from the analysis of human and animal perception. Life is considered as a primary given fact about the relation of the man (or the animal) with the world. The organism-world relations are, consequently, regarded as meaningful units and analysed as such. The phenomenological method developed by Straus engages both the experimenter and the subject and we will show that it leads to conclusions that are, on many respects, similar to those claimed by biosemioticians (e. g. J. Hoffmeyer, *Signs of meanings*). However, according to Straus, the human understands himself historically: "the consciousness of the individual person unfolds as the experience of his own inner history. Every single moment is a phase in his historical becoming." This historical aspect, however, is specific to humans. We will present the differences between human (historically shaped) and animal (not historically shaped) perception and see how the notion of historicity can also be assumed by biosemiotics. As a conclusion, we will discuss some similarities and differences between biosemiotics and phenomenology.

**World is not an object: Work of Zdeněk Neubauer as inspiration for  
biosemiotics in Prague**

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The presentation shall focus on the life and work of Czech biologist and philosopher Zdeněk Neubauer (born 1942). After a promising career in molecular biology, the young scientist decides to devote himself to philosophy. This double background – scientific and philosophical – enables him to develop interesting concepts on the field of the philosophy of science, many of them highly relevant even nowadays. A strong criticism of objective reality as the only possible and correct attitude to nature leads to interest in alternative biological paradigms (Adolf Portmann, Barbara McClintock...) and reveals objective reality as a fruit of mutual interpretation and communication within the scientific community. The scientific concepts are seen as products of culture, developed after long years of intellectual cultivation; therefore creating a picture of the World we are responsible for. With a main inspiration in biological structuralism and hermeneutical philosophy (Paul Ricoeur), he emphasized the role of signs, symbols and narrative structure of human knowledge in his lectures and texts in the 1980s in the framework of former Czech unofficial philosophy. At the beginning of 1990s, after the collapse of the totalitarian regime, Zdeněk Neubauer helped to reestablish the Department of Philosophy and History of Sciences at the Faculty of Science and became its patron and the main inspiration of contemporary biosemiotic studies in Prague. Many of his works were published, many of them remain unpublished. The current members of the department work on an archive and prepare selected texts for publication in English.

## Rethinking art, regulating growth: Lotman's evolution from the artistic text to the semiosphere

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Four decades ago, Sontag identified cancer, a disease of uncontrolled growth and systemic deregulation, as the paradigmatic illness of our times (1978: 15). Since then, the intensifying tension between neoliberal and ecological ideologies of growth and degrowth has only confirmed the importance of this topos for our societies, a topos we will discuss by examining the maturation of Juri Lotman's theory of art under the influence of biological notions of metabolism and homeostasis.

Although Sontag admitted that her correlation of cancer and capitalism was mainly metaphorical, it evoked the possibility of establishing structural isometries between biological and cultural levels of organization. For Hayles and Pulizzi, these isometries can be found at every level of semiosis (sign process linking an agent to its *umwelt*), which is "fractally complex, occurring at cellular and sub-cellular locations all the way up to consciousness and beyond" (2010: 145). It is through such isometries that Lotman shifted from his early vision of art as a force for linear progress and growth to an ecological perspective resituating art within cycles of stabilization and cultivation.

In his foundational work, *The Structure of the Artistic Text* (1971), art is a generator of new languages that allow a culture to adapt to its ever-evolving context; art is thus valued for its innovative capacity, and a culture, for its ability to conquer, tame and assimilate new languages. Inherited from the avant-garde Russian Formalists, and more generally from Modernism, Lotman's tendency to consider art as a mechanism of linear growth and progress will be, in the twenty-some years leading to *Universe of the Mind* (1990) and *Culture and Explosion* (1992), counterbalanced by the progressive introduction of biological and ecological models and images.

It is on the backdrop of such introduction that we will discuss particular aspects of Lotman's semiosphere such as its asymmetrical structure with its center and periphery, a structure obeying the rhythmical cycle of ingestion (causing growth) and self-description through auto-communication (leading to stabilization). We will compare elements of Lotman's thought with similar metabolic and homeostatic mechanisms of control to understand how, in biological maintenance as in the life of a cultural environment, regulation of growth comes about through semiotic activity.

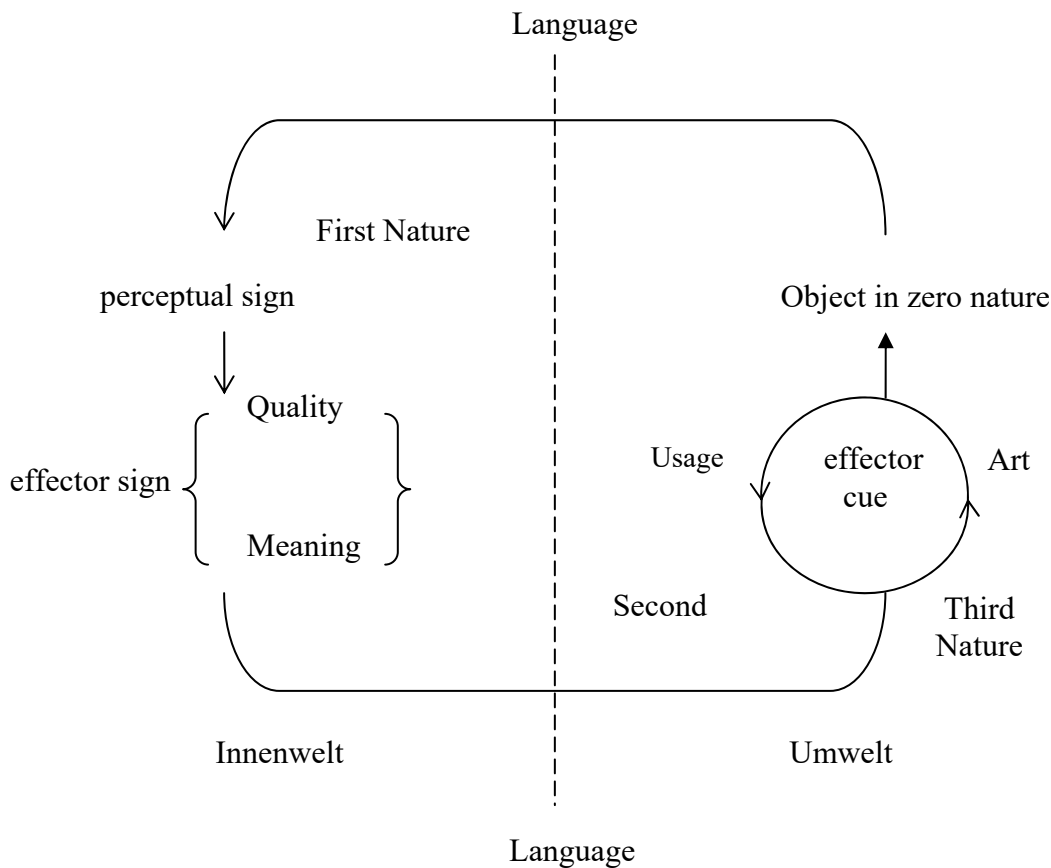
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## Signs constructed by cultural umwelt: taking moss in chinese culture as an example

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The concept of Umwelt raised by Jakob von Uexküll is the theoretic foundation of ecosemiotics, which deals with the sign-filtered and mediated relationship between human and nature. Language, as the boundary of cultures, according to T.A. Sebeok, is the secondary modeling system for the Umwelt of human beings, and shapes the world of meaning. Such a perspective is a further development of the theory of Tartu-Moscow School of Semiotics who takes language as the primary modeling system of cultures. Taking culture as an autopoeisis system, this paper aims to propose an ecosemiotic model, an integration of the model of “functional cycle” as well as the idea of “Multiple Natures” by Kalevi Kull, and explains how signs of nature are built by cultural Umwelt. The model is as follows:



Taking moss as an example, this paper uses this model to analyze how moss becomes a symbol loaded with medical, ethnic, and aesthetic values in Chinese culture. It is pointed out that the “quality” of an object is not an objective or neutral thing, but subjective characteristic given by culture. Due to the repeatability and circularity of functional cycle, this new model supplements the idea of “Multiple Natures”, and is capable of describing a meaning-generating process, in which a quality or an object that does not exist could be created.

## **Conceptualizing a minimal framework for the implementation of biosemiosis**

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The main objective of this paper is two-pronged: First, we will argue that biosemiosis is necessarily *implemented* in organisms; and second, that we can conceptualize this implementation as an abstraction at the minimal level of its expression. The concept of implementation will play a pivotal role in providing the grounds for a concept of minimality with regards to semiosis. The idea is that a sign function can only be implemented within certain physiological constraints in relation to their environment. To this we must add some cohesive propositions for arguing that semiotic relations can hold. Some of these premises include the idea of the potential multiple realizability of semiotic implementation, and the physical instantiation of its conditions.

By grounding biosemiosis in its implementation and utilizing a notion of semanticity built up from H. H. Pattee's work on irreducibility and complementarity, we can express the tenets of a reduced form of biosemiosis and model it by making use of a notion of minimality. Minimality here will depend on a conception of the organism insofar as it can be construed as a model on which semiotic functions can take action and through which we can model the base level of relations that can be called semiotic.

This tentative model will thus provide us with an account of semiosis that can supplement the philosophical discourse of biosemiotics by basing itself on a number of premises related to the possibility of speaking of physicality and sign entailment. By taking relations as primitive, but semanticity as derivable from systemic properties, we can develop a competing theory for biosemiosis in a simple expression through a layering strategy dependent on material embodiment, semanticity in its special sense and basic properties of minimal cognition as a checkpoint for the elements that can be implemented when referring to biosemiosis.

**Jointly structuring shared spaces of meaning and action -  
the development of increasingly complex semiotic processes in  
infant-caregiver-object interactions over the first year of life.**

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How do we arrive at a shared world, which we can communicate about, jointly act in, transform and co-create through our actions? How do infants grow in and into culture and become competent participants in cultural practices and complex networks of meaning-making involving people and artifacts?

Presenting examples from a naturalistic longitudinal study visiting infants (and their families) at home once a month from 3 to 12 months of age I will show that cultural object routines are practiced together from 3 months on, involving making sense of the situation together, and the social co-ordination of attention and action between participants and objects.

Analyzing selected activities - such as the semiotically rich book sharing, nappy change, or peekaboo - at the micro-level, I will 1) describe how infants & caregivers jointly create multimodal shared spaces of meaning and action which may provide a shared framework for orienting each other, and hence for co-operation and language. I will then 2) explore the development of joint meaning-/participatory sense-making over the first year of life: from infants letting their attention be guided by local cues provided by the caregiver and moving through affect-imbued action arcs together (beginning, rise, climax and resolution), via establishing and ritualizing shared routines (with infants showing anticipatory gaze and movement), to jointly relating to, modifying, and negotiating the established, shared action routines (reflective, recursive action). These routines may then serve as early “objects” of joint reference within a larger shared framework of meaning and action probably paving they way for more complex processes of joint reference and meaning-making.

## Reciprocal scaffolding and evolution of composite agency

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Life can be viewed as evolving open and recursive self-constructing agency, where openness means selective interaction with material resources, energy, signs, and other agents. The products of construction are meaningful as far as they support new cycles of self-construction by providing necessary resources, scaffolds, sensors, effectors, and semiotic networks. Such constructive approach to biosemiotics is compatible with traditional biology that studies molecular interactions, cellular functions, development, and behavior of organisms; but in addition, it assigns meanings to biological structures and functions, and shows that construction is not limited to material structures. In particular, sign relations are also constructed based on accumulated individual and inter-generational experience, and become essential components of living systems. Constructive biosemiotics differs from autopoiesis theory in recognizing semiotic aspects of construction; it also differs from structuralism in accepting the openness and dynamics (behavioral, developmental, and evolutionary) of living organisms and their subagents. All organisms are composite agents as they include subagents of various size and complexity. Composite agency emerged as early as life itself because each task or function required specialized subagents. The cohabitation of multiple kinds of (sub)agents is a necessary condition for adaptability and evolvability via establishment of new relations between them. In particular, agents become involved in *reciprocal scaffolding* by enhancing the functions of each other. At the protosemiotic level, scaffolds include functional 3-D structures (e.g., ribosomes, cytoskeleton) and encoded signal relations (e.g., transcription factor binding sites in promoters and enhancers). At the eusemiotic level, scaffolds include direct control of subagents, deception, and most interestingly, setting constraints on the long-term evolution or learning. The latter kind of control is “soft” because it does not diminish the capacity of subagents to adapt and learn. For example, the sense of pain guides the development of brain and neuron wiring so that acquired neural functions cause no harm to the body. In this case, the subsystem of pain receptors, nerves, and interneurons provides a scaffold for the development of movements and reflexes that prevent injuries. The composite nature of organisms results in their mosaic phenotypic identity and distributed cognition.

**Nondestructive, fast, ultraviolet: the application of uv photography in ecology, taxonomy, and evolutionary biology**

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Research of ultraviolet pattern was in the past relatively neglected due to technical limitations in this field. Nowadays this topic receives greater attention, mainly thanks to technological advances in the methods of image capture and image analysis. UV photography is one of the methods which provide the possibility of capturing quantitative and qualitative data of UV pattern. Nondestructive UV photography offers several advantages in comparison with standard spectrophotometry. Primarily, it is capable to capture a standardized picture of an entire UV structure. Furthermore, UV photography is relatively fast and able to process a whole series of objects. A camera specially adapted for UV photography has a broad sensitivity spectrum, and is equipped with uncoated UV transmitting lenses, as well as special band-stop filters. An artificial light source is used to illuminate photographed objects. UV photography may be combined with other methods of image and shape analysis such as Fourier elliptic analysis or geometric morphometrics. These methods allow quantifying the shape comparisons between two or more organismal structures or patterns. Differences in shape can represent differences in functional roles, different responses to some environmental stress, or differences in developmental growth. This approach was employed in a study dealing with correlations between environmental variables and shape variability of UV pattern in *Gonepteryx rhamni*. UV pattern in *Eryphanis zolvizora* was deemed as an effective reproductive isolation mechanism. Modern methods of image analysis are another indivisible component of UV research. For instance, UV intensity is measured from patches which are delimited by morphologically corresponding elements on the dorsal side of the butterfly wing. We used this method to reveal that large-scale environmental factors affect the intensity of UV reflectance on the forewings in *Pieris napi*. All these methods are applicable in a wide range of organisms and organismal structures.

(POSTER)



## A brief history of the cultural semiotic of wolves and sheep

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Wolves and sheep go together – at least in the public mind. In terms of ecological range, they are among the most widespread mammals of wild and domesticated species respectively. While the wolf is in several countries the most controversial large carnivore, it is also, and not coincidentally, the most symbolically laden Western carnivore. The wolf is a symbol of large carnivores, governmental interference in local issues, freedom and authenticity, evil, hunger, sexuality, etc. Sheep, on the other hand, represent among other things innocence and vulnerability (and, of course – food, wool and thus economic value).

The juxtaposition of the symbolism of wolves and sheep go all the way back to the Bible, if not even further. In the Bible, this archetypal opposition is only resolved in the vision of a new Earth and new Heavens, when, in this new paradise, “[t]he wolf and the lamb will feed together” (Isaiah 65:25). Meanwhile, everybody “knows” that wolves prey on sheep. However, many would be surprised to learn that in Norway, wolves over time only account for 4–5% of depredation on sheep (Rovdata). This demonstrates the way in which people are informed not only by facts, but also by cultural imagery.

Familiarity with the cultural imagery of wolves and sheep is arguably a precondition for fully understanding the fierce human emotions that are invoked in social and political conflicts on wolf management and conservation. Although there are local variations, and even though imagery and symbolism can change over time, the “background noise”, as it were, of the historical cultural semiotic of wolves and sheep is significant practically wherever there are, or were, wolves.

In this paper I will present central and illustrative examples of the symbolism of wolves and sheep from a historical point of view. The historical perspective will help making sense of developments in animal imagery. The topic matter is of interest not only because it says something about how we conceive of animals, but also because our representations of wolves and sheep are often used to construct human identities. As a matter of fact, the cultural imagery of wolves and sheep is just as telling about who we are, as humans, and how we think about ourselves, as it is about actual wolves and sheep.

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## What do animals think about speciation?

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Current theories of sympatric speciation usually presume the emergence of a key genetic variability which influences mating preferences and therefore precedes reproductive isolation. There are, however, numerous sound arguments that purely phenotypical behavioral traits which are culturally transmitted (e.g. dialects in songbirds) can lead to a formation of preferentially mating subpopulations; precursors of species.

We would like to argue that, to understand such a complex problem, it is handy to let a reasonable amount of anthropomorphism into our models. We are all organisms, results of complicated interactions of genes, epigenetic regulators, and cultural variants with historical experience. We perceive ourselves as individuals who know very well how to orientate in the world using available cues and signals and whom to mate with. The same applies to animals. Homogamy – pairing with self-resembling individuals – was described in humans as well as in many non-human animals. It was hypothesized that preferences for self-resembling individuals could be facilitating incipient sympatric speciation in killer whales (*Orcinus orca*), blind mole rats (*Spalax galili*), or even European corn borers (*Ostrinia nubilalis*).

This phenomenon should not be perceived mechanistically even if it is frequently modeled in that way. Animals actively interpret their experience in the world and are, to some extent, capable of construing their own identity. This self-image is, in my opinion, formed and adjusted through the comparison with conspecifics, which set the existence of an individual in context. Genetic background as well as acquired features, kin assignment, and lived experience therefore all contribute to this self-representation, which, in turn, determines mate preferences and, in social species, also the selection of allies. We can say, with a slight exaggeration, that animals are seeking partners with virtues they appraise.

It is not hard to imagine that a species with more possible ecological strategies (and thus prone to sympatric speciation) develops competing “life philosophies” based on the preferred strategy. We can illustrate this comparing hares, which praise hard but unrestrained and independent life to rabbits, which tend to rely on a mutual help and collectivism. This discrepancy could have led to speciation in family Leporidae even multiple times since rabbits are not a monophyletic group. Sometimes when looking at two related species, it is not easy to approach similar phylogenetic event with fable-like narration, but that does not mean that some un verbalized “story” was not in the core of the recorded divergence.

Similar interpretative actions may also facilitate parapatric speciation since spatial demarcation can be simultaneous or even subsequent to identity divergence or help to keep two groups without complete reproductive isolation apart, for example when geographical isolation lasts only briefly. Cognitive precursors of distinct varieties and species might be especially important in humans, due to their huge brain capacities and prominent in-group/out-group classification tendencies.

## **Representational systems in zoosemiotics and anthroposemiotics: what have the so-called „talking animals“ taught us?**

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The presentation is an outcome of my long-time pursue of a critical review of the so-called "talking animal" projects, wherein the researchers have tried to train their animal subjects to perform "linguistic" feats. My critical summary of the case studies culminated in a zoosemiotic theory of „representational systems“ – a suggested outline of possibly useful concept for zoosemiotics and anthroposemiotics.

Considering both the fundamental dissimilarity of the projects and the uniformity of their results, I was lead to conclude that the shortcomings were those of the students - the animals, and not those of the teachers – the human researchers. Failure of the animal projects points mainly to the fact, that a core feature of language is missing in the pseudolinguistic feats of the animals - what is missing is hierarchical recursive syntax.

I have concluded that no animal has had likely adopted the open, unbounded, hierarchically recursive system that allows us, quite literally, express anything. Linguistic data that I considered indicates that language is most likely an inborn neural specialization, one that is species-specific to *H. sapiens*.

All the available facts considered manage to show that the pseudolinguistic feats of the "talking" animals are most likely caused by a great plasticity of general cognition. General cognition has the capacity to virtually simulate (although imperfectly) certain aspects of human neural linguistic specialization. Neural linguistic specialization in *H. sapiens* is an evolutionary discontinuity, whereas the general cognition plasticity is evolutionarily continuous trait. The fact that animals are deft and clever enough to simulate other specializations with general cognition, is quite frankly more interesting and surprising than if they were caused by emergence or continuity.

Humans tend to misinterpret the pseudolinguistic feats of the "talking" animals as linguistic achievements. Language specialization in humans causes anthropomorphism in the communication with nonhuman entities.

The answer to the question „why the „talking animals“ do not really talk?“ most likely incorporates the notion of „representational systems“. What sets humans apart from the animal kingdom is their capacity to use both the primary (and possibly secondary) representational system, just as other animals do, *and* the meta-representational system, which is being used as a communication tool at the same time. Human Natural Language is a manifestation of the meta-representational language, which is a species-specific neural specialization.

Animals are most probably perceiving something that would seem like an undifferentiated mass of perceptions - illogical monoliths, that are differentiated into parts according to rules and logic that would seem alien to us. The representational principle is different in us and other animals – the representational grids upon which sensoria and memory inputs are mapped are different. Human Meta-Representational System has powerful inferences upon our perception of reality - it "cuts" the reality into parts that enter into interconnected interaction in accordance to its own rules and logic. Hierarchical recursive syntax that combines discrete units (as seen in natural languages) is a manifestation of this representational logic - a human-specific "way of seeing". Meta-Representational System allows humans to perform „double-mapping“ – use Primary (and possibly Secondary) Representational System, to map both sensoria inputs and memory inputs onto representational grids – and then map those inputs once again onto another grid. Most of what we „think“ and „see“ are multiply layered re-re-representations. This has of course important ramifications on human umwelten.

## Tapping into the languages of the Land

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Within our media landscape, novel sign systems, such as emoji, are created to express our emotions and feelings to be shared immediate and broadly. These languages appear to easily cross traditional language boundaries. Yet, other signals in our immediate environment that can impact our health and happiness escape our attention. These include the languages of the land, signs that are emitted by other species and natural processes. Signs of materiality that we have not learned to interpret for our, and other organisms' benefit, for which we have not created a common symbolic system to enable communication of these messages of the land. I address this problem in my current research and (field) practice.

My work is rooted in the notion that the senses are a, or maybe *the* primary source of knowledge. Signals in the ambient sphere can be seen, heard, smelled, felt, and in other ways sensed and interpreted by organisms as unique adaptations for survival. In addition, humans increasingly rely on 'extra somatic means' of adaptation, sensing technologies that expand the limitations of individual space/time and sensing range. These sensing technologies and systems have greatly enhanced our understanding of the world. Yet, again, many signals in our environment escape our attention.

Whether we, as humans, have not learned the languages of the land or lost our ability to do so, I believe that a change in approach is necessary theoretically and technologically to better understand these languages of the land, in order to communicate effectively between living systems, beyond our social networks.

Currently I am involved in collaborative research focused on sounds and odors of the land, based on the assumption that these signals provide important information regarding our ambient sphere, biodiversity and environment in general across scales. Lack of knowledge regarding the role of such signals in inter and intra-species communication impedes our ability to understand complex environmental phenomena. A new approach is necessary, one that is based on crossovers between research and design to create novel sensors and -symbolic -systems for a knowledge system of the land that can be shared and communicated widely. My collaborative projects, based in the Netherlands and Italy are a step in that direction and the progress of these efforts are shared in this presentation.

## Habits or dispositions – of their biosemiotic and non-semiotic fixation

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Whenever we investigate processes of living creatures, it is natural to focus on regularities or regular causes of observed regularities. This is also so in semiotics and biosemiotics – the “signness” of biosemiotic signs is dependent on their functioning as signs in regular ways, i.e. on their ability to become *habitually* interpreted as the signs they are.

Habits play more than one role in biology. 1. *habits of interpretation* must be distinguished from 2. *habits action*, although number of sign-interpretations are often involved in action. Moreover, 3. existing habits (no matter whether of action or interpretation) have a tendency to become recognized by other agents and become to function as signs for them (Hoffmeyer’s semiotic interaction). 4. In Peirce’s semiotic theory, the habits may also be produced in semiotic processes – habits of interpretation are flexible regularities that are designed to be modified by the feed-forward loop in the process of interpretation – when a sign is interpreted according to a habit of interpretation, this process may specify, strengthen, or modify this acting habit – or substitute it through a creation of a new habit.

It is important to notice that “habit” is here used in two different senses – in its 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> roles, “habit” is a mere *occurring* disposition, tendency, or regularity. Only the 4<sup>th</sup> sense of “habit” provides a stronger and more proper concept of habit as a regularity that has certain appropriate *origin* in an earlier semiosis. Peirce makes this distinction explicitly but uses the term “habit” inconsistently in both of these senses. Hoffmeyer’s notion that habit formation is the core of semiosis is not wrong but perhaps a bit exaggeration that may lead to fallacies that are comparable to adaptationist fallacies. Not all habits are due to semiosis and not all sign action have influence to habits (Peirce). In biosemiotics, it is more difficult to detect whether the habit of interpretation is in itself also semiotically produced than in ordinary human semiosis. This is especially so, if our focus is in evolutionary processes – what we usually can observe are mere regularities (habits in 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> senses) and their possible functionality, which may seduce us to assume *a priori* that they have always semiotic origin.

**Biosemiotics without *biosemiotics*:  
A view from the Moscow side of Tartu-Moscow semiotic school**

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In a series of interviews, which have recently been conducted with representatives of Moscow members of the Tartu-Moscow semiotic school (V.V. Ivanov, B.A. Uspenskij, D.M. Segal, etc.), (former) Moscow scholars were asked about their attitude towards biosemiotics. Supplied independently from each other, their answers nevertheless turned out to be very similar: as experts in humanities (mostly linguists and specialists in study of literature and its history), they acknowledged their fascination and interest in problems of biosemiotics and attributed a leading role to biosemiotics in future semiotic researches. At the same time, the interviewed scholars said that they had not enough knowledge to discuss any biosemiotic questions in detail.

In our paper, we are going to analyze both the texts of (some still unpublished) interviews with Moscow semioticians and their well-known theoretical works in which questions of biosemiotics are nevertheless discussed. Among the latter, let us mention in particular

- a) animal language study and questions of non-human communication in general,
- b) the possibility of a “dialogue” between humans and animals (inter-species communication),
- c) problems of the evolution of human language in the light of gradual transition from the use of one type of signs (signs-icons) to another (signs-symbols),
- d) study of “languages of the brain”,
- e) discussions about multi-semiosis, etc.

The references provided in these works could be classified as “evident” or “hidden”. While the research of Th. Sebeok seems to be directly mentioned the most often, the influence of Ju. Lotman’s work on the researches of Moscow semioticians can be felt indirectly, between the lines of their numerous studies.

An overview of the corresponding works of Moscow semioticians will allow us to raise the question about the philosophical and epistemological premises of the (implicit) point of view when a scholar doing biosemiotics fails to admit it, preferring other designations; this situation remains common even today. In other words, the reasons for doing biosemiotics without using the its name (doing biosemiotics without *biosemiotics*) will be explained.

## **Animal abduction: Can non-human animals make discoveries?**

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The aim of this paper is to investigate the relationship between information and abductive reasoning in the context of problem-solving focusing on non-human animals. Two questions will guide this investigation: “Do non-human animals perform discovery based on inferential processes such as abductive reasoning?”; “What is the difference between the processes of discovery and problem-solving in humans and non-human animals?”. We discuss the notion of scientific investigation understood in a broad sense, like in Peirce, as the ability to generate and change habits through abductive reasoning. In Peirce’s analysis, the process of inquiry takes place when a certain fact does not allow actions to occur in a natural way. The starting point of inquiry, i.e., doubt, triggers the inferential process of hypothesis-making or abductive reasoning. The aim of abduction is to incorporate a strange fact into a network of beliefs by means of suggestions of general hypotheses. According to our understanding, human and non-human animals have the semiotic ability to generate new hypotheses by the access to information. In this paper, we will make use of the semiotic concept of information through a study of the sign defined by Peirce as “a medium for the communication of a form” (EP2, 1998, p. 477). We consider here a broad sense of intelligence, named “scientific intelligence” as proposed by Peirce. We assume that information, in a semiotic sense, can be grasped by humans, non-human animals and others living beings, and that abduction, fed by information, allows the reestablishment of state of belief. Inspired by Magnani, we explore the relation between discovery and information in non-linguistic contexts: “If awareness, whether propositional or perceptual, is semiotic, then all awareness involves interpretation of signs, and all such interpretation is inferential: semiosis not only involves the interpretation of *linguistic* signs, but also the interpretation of *non-linguistic* signs.” (Magnani, 2009, p. 276). As a case-study we discuss non-human discovery through the analysis of corvid's intelligence. Inspiring by social cognitive studies of corvids, we focus on their ability of pilfering/catching and hiding food from other conspecifics, emphasizing the relationship among information, abductive reasoning and deception in a non-linguistic context. As Bugnyar (2013, p. 3) stresses: “[u]nder naturalistic set-ups, both cachers and pilferers engage in behavioral maneuvers that function to deceive others, i.e. they conceal information (e.g. by hiding outside view) and provide false information (e.g. by distracting others from the cache location)”. Finally, we explain the constructive role of cognitive tools in abductive processes to explain how abduction in scientific discovery in a human context differs from animal abduction.

## **Systemic Psychotherapy, systemic counseling and hypnotic processes reflected with the nine sign aspects of Peirce**

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From a semiotic perspective the object of psychotherapy or counseling is a therapy or counseling is a case. A case is not simply a thing that can be discovered and investigated but is constructed by means of a lot of different factors. E.g. the health care system (in therapy) or other legal regularities, definition of normality, theory of change, description of the Problem and expectations of the clients , therapists or counselors the organizations and institutions involved in the process, etc.. The construction of a case can be described or reconstructed as semiosis. The notion of the problem is closely connected to the construction of a case. From the perspective of a systemic approach to psychotherapy and counseling systems do not create problems but problems create systems. The solution of the Problem is defined by Wittgenstein as the vanishing of the problem. For a systemic approach this means that conditions of absence of the problem have to be investigated in a psychotherapy or counseling session. Modern ericksonian hypnotherapy can be described as operating in a similar way but using different means of meaning making. For a systemic approach interaction and interpsychological communication processes are regarded as the primary means in which the absence of the problem has to be investigated and the solution constructed. This investigation can be seen as the construction of the solution. This process can be described as Semiosis. Modern hypnotherapy is more interested in how the organism is capable of creating trance which is described by the client as involuntary experiencing. Trance can be differentiated in problem-trance which is the undesirable experience of the problem and solution-trance which is the desirable experience of the solution. Now Trance as Problem- or Solution-trance can be described as semiosis too. But more important the shift from the problem to the solution – be it viewed as trance or as the construction of a system through language – can be described as semiosis. This meaning or reality is co-constructed by the client, therapist or counselor, therapy or counseling organization, etc. I compare this continuous and discontinuous process of meaning making to reversible figures like to Necker cube or the duck-rabbit. I use Wittgenstein's notion of seeing as... or aspect seeing to illustrate this process with the nine sign aspects of Peirce. I use a psychotherapy case and a counseling case from deradicalization work in the context of political extremism.



## Effects of high-diluted agents for leishmaniasis explained as a biosemiotic phenomenon

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Leishmaniasis is a disease caused by intracellular protozoan parasites from genus *Leishmania* transmitted to humans and animals by the bites of infected female phlebotomine sandflies; the protozoans parasitize mononuclear phagocytes. There are three forms of disease, cutaneous, visceral and mucocutaneous, which cause injury likely to result in disfigurement, permanent scars, mutilations and death in the case of untreated visceral leishmaniasis. Brazil, Peru, Iran, Afghanistan and Saudi Arabia account for 90% of cutaneous leishmaniasis worldwide; about 12 million new cases are reported per year. Treatment is based on the use of pentavalent antimonials, which increase the production of several cytokines. However, as a function of their severe side effects, alternative treatments are currently being developed.

In our series of studies we tested the action of high-diluted antimony trisulfide and thymulin on an experimental model of *Leishmania (L.) amazonensis* infection. Thymulin is a nonapeptide produced in the thymus and involved in several physiologic events, mainly T cell differentiation, activation of several immune cells and cytokine production. Thymulin was selected because in previous studies it showed a relevant role in the control of experimental chronic virus- and bacteria-induced inflammation. We found effects indicative of immunomodulation in both cases, with phagocyte migration and increased activity after treatment with thymulin and decreased phagocyte migration with antimony treatment *in vivo*. A marked increase of macrophage spreading was observed *in vitro* too, in thymulin ( $10^{-13}$  M) treated cells and in the ones treated with antimony (approximately  $10^{-60}$  M). Only antimony (approximately  $10^{-400}$  M) was associated with increase of the phagocytosis index. These findings show specific activities according to the solute nature and dilution and might have therapeutic implications we are currently exploring.

Now, the concentrations used are too low or plainly above Avogadro's number for the effects to be explained in the terms of key-locker molecular interactions. The rationale behind the choice of these dilutions was the assumption that living beings exchange both molecular and non-molecular information via physical mediators. In the latter case, the effects are allegedly induced by biological signals. Indeed, the current language of biology is deeply impregnated by notions originally belonging to information theory and semiotics. Application of semiotics to living nature is known as biosemiotics, which means that all the processes in living beings must be investigated and understood as sign processes. Chemical reactions are now considered to be resources to generate, conserve, and convey information. The semiotic nature of the intracellular signaling pathways is widely acknowledged, and also intercellular pathways, such as the ones involved in the neuroimmunoendocrine network, reveal their ability to interpret signs, which might be chemical, electric, magnetic, thermal or mechanical. What is the case of highly diluted drugs? Since very few or no molecules at all are likely to remain in the solution, it is safe to assume that their actions involve a typically triadic situation, in which physical changes induced in the solvent behave as the sign as such, i.e., C.S. Peirce's representamen.

## Interpretants of Zoey's world

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Much attention has been accorded to the semiosis of the interpretant in human ontogeny (West 2011, 2013, 2016) and in adult logical and practical genres (Stjernfelt 2014; Bellucci 2014; Kilpinen In Press). The literature is replete with analyses of Peirce's Dynamical Interpretant, from the Emotional, to the Energetic, to the Logical (Short 1996 & 2007; Bergman In Press). According to Peirce (October 1906: MS 339: 287-289R), Dynamical Interpretants constitute the only actual interpretants, because they are the only real effect of the sign; whereas Immediate and Final (Normal Interpretants constitute either possible or abstract sign effects/meanings. I examine Dynamical Interpretants in a non-human species (parrot), in view of the more practical nature of the species.

The meanings and/or effects which Zoey (an eighteen-year-old African Grey Parrot) attributes to the same sign gives us pause, as to whether human meaning construction is special after all. Her use and comprehension that two distinct linguistic signs in two different languages (English and Spanish) is not sufficient enough to demonstrate that the same interpretant applies, e.g., she interchangeably uses "*adiós*" and "bye-bye;" and "*hola*" and "hello." To illustrate, "*adiós*" is employed spontaneously in all of the following situations: at night when the light is still activated, upon retrieving the dog's leash, upon donning coats, upon slipper removal, and in an appeal to be covered for the night. Nonetheless, Zoey likewise associates the same familiar term in English with novel places and temporal contexts. Without prompting, Zoey applies "shower" to cascading water in four distinctive situations which surfaced naturally (not contrived): in the bathtub (original context), in the kitchen sink, out of doors when the hose was in operation, and again out of doors upon feeling rain drops. This process of extending interpretants to ever increasingly analogous (but quite distinctive situations) demonstrates referential competencies – picking up information implicitly and assigning it to particular signs. The interpretants that Zoey associates with the same linguistic sign are Dynamical in nature – on each occasion they entail action-based effects; and the Objects are virtually co-present, demonstrating a marked dependence on indexical properties.

## **The deep-shaping power of the human modeling process**

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Thomas A. Sebeok's reformation of the critical Lotmanian concept of modeling has made a significant contribution to our common cause of semiotic inquiries. However, contemporary studies on Sebeok's thoughts on modeling, in particular Modeling Systems Theory co-presented by Sebeok and Marcel Danesi in 2000, are largely confined to introductions and applications. Seldom has the possibility arisen that they can also be tested, expanded and refined through interactions and collaborations with other research findings in order to remain a living system and become a more functional one. This conviction has directly inspired the present writer to incorporate into semiotics the latest confirmed discoveries in neurocognitive sciences, particularly cultural neuroscience, and thus formulate that the process of semiosis has an effective deep-shaping power over the individual human modeler. Put another way, aside from the long established Pericean belief that signs philosophically and epistemologically make us what we are, it should be noted that the behavior of modeling actually influences and even alters the organic make-up and biological structure of the human body, in particular the human brain. This synthesis brings to light a hidden fundamental mechanism that underlies the diversified manifestations of sign activities in and across different human societies and cultures. It is also believed to be able to help understand human communication from a dynamic Biosemiotic perspective.