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“Eating and incorporation, from symbiogenesis to society”

When asked for this panel to consider food from a biosemiotic perspective, I thought first of the fact that I, as a farmer, have eaten animals that I had raised, named, and communicated with before finally leading them away to slaughter. I begin, therefore, noting the irony of my claiming to be a humanitarian while also being somewhat red in tooth and claw. But that’s enough about my incisors. For this talk I would like to reflect on the process of eating as just one of the ways, from symbiogenesis to society, in which the other is incorporated into an ever-widening body.

I consider the dehumanization, defined as the reduction of semiotic freedom, of the individual within a larger society. I think about how the individual always loses its creative potential when it becomes part of a whole. In the process, the individual gains other things too, of course, in particular, usefully constraining contexts, without which a self could not be differentiated. But there needs to be balance. The less semiotic freedom an individual human has, the easier it is for political/religious leaders to sacrifice him to the whole.

I have spent a dozen years now trying to work out biosemiotic theory as it applies to science, philosophy and aesthetics. Now I want to turn to larger audiences to apply what we’ve learned to social and political issues. I think most of us here understand the larger implications of the work we do on the life of the cell and the efficacy of the sign. It may be obvious to us what kind of social and political thinking a biosemiotic perspective tends to lend itself to, but it’s not obvious to others.

We face a challenge. We live in a deeply anti-intellectual world, especially in the U.S., where stupidity has been trending long before 2017— just as much among the faux intellectual elite as among the undereducated.

My role as a Public Scholar is to promote the Humanities and to end the false separation between the arts and sciences that has really been deadly to thought. Lately I’ve been thinking about Romantic poet Percy Shelley, a vegetarian not incidentally perhaps, who was one of the most radical political intellectuals of his time. He was also interested in science, as people in the arts were wont to do once upon a time. His father-in-law was a direct democracy advocate and his wife a radical feminist. The Goethean organicism that was associated with the Romantic period in literature is an ancestor, I dare to say a direct one, of biosemiotics. I’m going to look at history and try to find the forks at which we took the wrong way, leading us eventually into the crushing rocks of mechanistic scientism on the one hand and the whirlpool of postmodern relativism on the other.

For this talk, I will take my troubling meat habit as a jumping off point for a discussion of much larger issues about part/whole relations that are mediated by signs. The will try to answer the question, Biosemiotics, what is it good for?

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“Biosemiotic interventions in curricula and pedagogies”

In educational institutions for learners of all ages and persuasions and places, one tends to witness well-intentioned teachers or professors and students (all, co-learners), who, with strenuous effort, carry out the policies that they inherit from an accumulation of bureaucratic hubris. Some of these policies and the assumptions underlying them have histories extending for generations if not even centuries.

This paper argues for periodic perturbations of these structures—whatever they may be—with respect to both curricula and pedagogies. The motivation would be to destabilize whatever overdetermined developmental structures have settled into the professions and the communities, to invite periodic chaoticities, and to allow fresh evolutionary trajectories to emerge. It matters not how many institutions indulge in these (bio)semiotic interventions, nor how often; the effects can hardly be deleterious. In no place or period would the aim be to perfect a choreography of subject matters and teaching styles. These will always already be nuanced by particular cultures, languages, and histories, although that nuancing may not incorporate any allowance for flexibility or respect or transcendence.

Already pioneers have advocated “across-the-curriculum” approaches for subject matters such as composition, mathematics, art (drawing especially). By default these approaches are semiotic. With respect to pedagogies, other pioneers have argued for team-teaching, for pod-discussions, for online instruction. All these have been desperate and self-conscious efforts applied at various levels in North America. What about introducing any “subject” with a (pre)history of the subject alongside the “history” of the teacher’s exposure to the subject? What about building on how individual neuro-cognitive habits shape both the subject and the teaching, and how collective and long-term conditions, even political economic, feedback onto the classroom (if it be a classroom).

In some instances, subject matters may melt or fuse, briefly or otherwise. In other instances, subjects may be animated by tracing some of their elements through space and time as social and/or linguistic histories—of containers and connectors, of tools and toys, of paradigmatic/metaphoric similarities and syntagmatic/metonymic contagions, of the number 2 and the color blue.

Curiosity can be counted on to fuel the open minds of teachers-learners of all ages. The only ingredient this proposal explicitly excludes is teachers who have already been taught how to teach!

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“Sourcing the semantic: biosemiosis and the origins of the self-determining subject”

The scientific revolutions of the twentieth century have moved the life sciences from a focus on static factors, both within the individual organism and relative to characteristics of the individual’s broader ecological context, to a dynamical, procedural view. The individual is no longer conceptualized as a mere mechanism, an unwitting subject of God-given fate or genetic determination, a hapless victim of chance or circumstance, or a wholly self-determining agent of inexplicable omnipotence. The individual of today is bound into a complex causal web of biological and historical predetermination, chance and fortuity, circumstantial and experiential mediation, and his or her own emergent agential power. Undergirding the experiential and agential capacities of the individual organism are the representational or interpretive qualities core to living systems. It is this birth of semantic information in abiogenesis that most ostentatiously lacks a robust biotic or physicochemical explanation. Only the provision of a sufficiently rigorous scientific account of the existence of the self-determining subject and its capacity to represent and act upon the salient features of its ecology stand to provide the foundations for an explanation of the phenomena of consciousness and agency such that they no longer appear anomalous within a material universe. This project promises a unification of the physical sciences with the life sciences and a unification of the life sciences with philosophy—a bridge across the Cartesian chasm.

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Grounding semiosis in a physical medium, a higher-dimensional superposed constraint terrain

The possibility of semiosis must explain many attributes of living systems, including: representation, interpretation, intentionality and normativity. The most parsimonious explanation will tend to resolve all these phenomena with one dynamic system; and, furthermore, this system will be of thermodynamics uniquely conducive to adaptive life. This proposal assumes the possibility of Terrence Deacon's autogen, or similar agents, at the origin of life. It then proposes a diverse local community of such proto-agents. As with celestial bodies and their superposed gravitational terrain, this localized community of agents necessarily entails a superposed physically pervasive constraint terrain, be it chemical, electromagnetic, acoustic or otherwise. Like waves mold the sandy shore, this superposed terrain molds the relatively high inertial dynamics of each proto-agent; and, like the sandy sea shore molds the waves, the agents' dynamics simultaneously mold this superposed continuous terrain, which is relatively less inertial. This set of superposed dynamically complex circumstances – together the “physical medium” – will create a high-dimensional “creative” possibility space that physically grounds the potential for semiosis with all the attributes listed above.

It will be shown how these specific attributes of the proposed physical medium – distinct superposed dynamics of differential inertia, which co-constrain each other creating an ever higher-dimensional terrain – resolve many of the intrinsic paradoxes that tend to mitigate a comprehensive understanding of biosemiotics and adaptive systems. Put another way, this proposed physical medium is a means by which ever-increased levels of complexity and adaptive work potential are assimilated by this dynamic; and, furthermore, that this internalized higher-order constraint increases the capacity for communities of agents to exhibit adaptive equifinal outcomes in the face of open system indeterminacy. This self-sustaining dynamic in the face of open system ambiguity grounds biosemiotics in first principles.

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“Terrence Deacon’s cognitive penumbra and Charles Peirce’s late classification of signs”

Between *The Symbolic Species* (1997) and *Incomplete Nature* (2012) Terrence Deacon does a lot of work with Charles Peirce’s trichotomy of the object dimension of the sign, icon-index- symbol. It is well known that the complexity of Peirce’s later classifications of signs goes far beyond this initial trichotomy, but how can the later developments be fruitfully applied to Deacon’s theories? Some progress in this direction has been made, as shown in the 2012 publication *The Symbolic Species Evolved*, specifically the usefulness of the division of the representamen dimension, sinsign (token) legisign (type) (EP2: 291), for the description of language acquisition (Deacon 2012a). Peirce’s late classifications of the sign provide many more useful distinctions, such as those of the immediate and dynamic objects (CP 8.183), and the division of the immediate interpretant into emotional, energetic, and logical interpretants (CP 5.473). These are useful for describing what happens during what Deacon refers to as the ascension of the representational hierarchy, where indexical token-object relations are subordinated to the dominant token-token system of the symbol (Deacon 1997: 415) and how responses are freed from stimulus driven immediacy, in the process of language acquisition. Using the example of obedience to military commands, Peirce writes that the process of habituation consequent to symbol use can result in the decrease in deliberation over the dynamic object, and a resultant reduction in the addicity of the trichotomy of the immediate interpretant, from a logical interpretant, to an emotional one (Short 2007: 202). Put simply, in the case provided by Peirce, the efficiency of the soldier depends on his or her ability to act without attention to contextual particulars. In Deacon’s terms, exactly that semiotic capacity which affords the higher processing power of verbal language can also entail a human specific detachment from reality, or a “cognitive penumbra” (Deacon 2006). In other approaches to the same phenomenon this erasure of particulars is called “semiotic closure” (Eagleton 1991:197). The application of Peirce’s late classification of signs to these ideas in Deacon’s biosemiotics is promising for continuing research into the interrelations between cognitive science, critical discourse theory, and the critique of ideology.

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“Between biological, semiotic and symbolic life: plasticity, intelligence and habits”

In this talk, I would like to outline the relationship between the concept of plasticity and the individual, social or collective creativity/inventiveness. We will focus on the epistemological, philosophical and semiotic implications concerning the links between biology, creativity of forms of life and semiosis, as a cognitive modality of human knowledge.

In particular, we would like explore three problematic issues: a) the relationship between brain plasticity and symbolic or semiotic plasticity, with the focus on the possible homologies between cerebral capacity of self-reproduction and self-transformation and adaptive capacity of behaviours (creativity); b) the centrality of a bio-semiotic approach in order to rethink in the same framework the dynamics of semiotic and complex interaction between organism and environment (or milieu); c) the analysis of semiosis by its non-individual dynamics of constitution (heterogeneity of flows) and evolutionary conditions of emergence. First, plasticity is a neural, cognitive, biological and eco-semiotics property of human intelligence. The French philosopher Catherine Malabou argues that intelligence is a metamorphic and strategic dimension of living beings. Following Malabou (Malabou 2017), the nature of plasticity implies the original correlation between epigenetic structures of development and the social structures of habitus. The description of social and semiotic behaviour (creative, innovative and incomplete) requires a global model of intelligence that is bio-semiotic and ecological oriented. Following Piaget and Dewey, Malabou argues that the plasticity is an aptitude to make sense from noise, order or uncertainty. The cerebral and semiotic plasticity can adapt, take advantage of chance, interpreting an ambiguous or indeterminate signal, establish similarities or differences. To understand this biological, social and semiotic faculty of human creative intelligence, I have to adopt a semiogenetic perspective. The perceptive theme is used here to prepare a double transition: on one hand to a theory of expression and semiogenesis and on the other toward an analysis of the construction of the semiotic subject and the production of semiolinguistic values. Social cognition must not only be described in terms of a shared attention that orients behavior and ontogenesis but must also be included in terms of semiotic participation of subjects, socialization and subjectification as simultaneous processes of expressivity and elaboration and the construction of environments (linguistic and anthropological linguistics). The problem which arises is how to implement these different levels or ways of expression: among perception of mute things, expressive commitment and linguistic explicitness (institutional semiosis); and equally among habitus, practical norms and institutional rules. The epistemological context and the models to be used are necessarily dynamic, constructivist and emergentist: unities of meaning, which instantiate types or functions given initially, are not presumed; emergency conditions and dynamics of the construction of forms are collected and organized in fields of practical interaction and semiotics (Bondi 2015). Finally, I will suggest a prospective scenario of emergence and evolution of language which radically differs from the dominant neodarwinian stance. The guiding principle is that of a synergy between various symbolic forms and activities. We define a model of Symbolic Economies which features the gradual unfolding of semiotic forms mediating the differentiation of social groups, roles and values (Lassègue, Rosenthal Visetti 2009).

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“It is Peirce all the way down: Why biosemiotics needs a Peircean triadic semiotic pragmaticist process philosophy to be transdisciplinary scientific”

There have been many attempts to save biosemiotics as a “real science” in the classical either dualist or monist view of science. It has typically been done by combining some sort of philosophy of natural or technical science be it mechanistic (Barbieri), cybernetic-systemic in Bateson’s and von Uexküll’s form (Hoffmeyer, Harrison Jones, Kull) or Bertalanffy general system theory (Hofkirchner), information theoretical combined with morphodynamics, system theory and non-equilibrium thermodynamics (Deacon), logical semiotics developing forms (Stjernfelt) with Peirce’s triadic process semiotics. However, then the aspect of his paradigm that does not fit with the present philosophy of science especially his agapistic Schelling inspired pragmaticist process view. I argue why this will in my opinion not work in a consistent way, which is part of the reason for construction Cybersemiotics integrating Luhmann’s threefold autopoietic system view into Peirce’s framework. Cybernetic, informational and system aspects of Bateson, Maturana and Varela as well as Uexküll lacks the foundation to encompass the phenomenological and hermeneutical aspects of perception, mind and communication. However, though cybernetics and system science were new interdisciplinary developments in the understanding of the sciences forged in the Macy conferences they were soon accepted in biology as system ecology and cybernetics as homeostatic regulation mechanisms the information concept coming from cybernetics’ technical foundation in Shannon and Norbert Wiener’s work. Contrary to this, Peirce’s work was only accepted in a phase of the development of modern logic, but his semiotics as logic was never really accepted neither in analytical nor in the phenomenological-hermeneutical philosophical traditions. To make the evolutionary link you need Peirce’s philosophy of knowing as well as semiotic process ontology all the way down as it was done in Romanini and Fernández: Peirce and biosemiotics! His non-dualist evolutionary process thinking’s combination of empiricism and German idealist philosophy (Locke combined with Schelling), was only possible through a semiotic process philosophy. The problem is that it competes with the physicalist as well as the info-computational view of transdisciplinarity epitomized in J.A. Wheeler ‘It from bit’. Peirce’s semiotic philosophy and triadic evolutionary theory of cognition and communication, is in my opinion is still the best offer if we want to create an alternative to the mechanization of mind from cybernetics through cognitive science to AI that Dupuy describes in his book On the origins of cognitive science.

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“Cybersemiotics as a tool for transdisciplinary philosophy of science teaching”

I have been teaching an obligatory course in philosophy of science, bachelor level, in Danish, at four different universities over the last 30 years in Denmark. In that time I have developed a Danish teaching book over three major stages. The last one is: *Tværvidekabsteori* (transdisciplinary philosophy of Science). Before that I published, in 2008: *Cybersemiotics: Why information is not enough*, now in paperback and on Kindle. Cybersemiotics has now been described in so many encyclopedias and dictionaries in cybernetics, systems theory and semiotics that my editor suggested that I used it to organize my new interdisciplinary teaching book. I presently teach in intercultural communication and economical programs within a business context, meaning that we have positivistic empirical behaviorist user studies at one end, social/ cultural communicative perspectives in the middle and perceptual phenomenological, hermeneutical conceptions at the other end with analysis of advertisements as an example. Is it possible to use biosemiotics to fashion a philosophical framework that can help students proceed from common sense to professional perception and use of concepts in analysis of embodied communication situations, including ethical and aesthetical aspects? To do this I found it necessary to include material on information theory, cybernetics and systems theory, summed up in Luhmann's autopoietic system theory, and then combine that with many types of semiotics using Peirce's pragmatism as the overall philosophy of science meta-paradigm for semiotic, linguistics, discourse theories and Actor Network Theory. The process view integrates systems/cybernetics' idea of self-organizing information. The autopoietic systems and the semiotic view of embodied mind interweaved in a dynamic, ever-changing meaningful sign web gives a bio-hermeneutical perspective also encompassing bio-politics (Foucault etc). I found it is possible to teach students about Luhmann's triple autopoietic communication theory and his generalized symbolic and then from there go to pragmatist semiotics, arguing that biosemiotics also encompasses the subconscious signs of the body. My teaching proceeds through dialectical materialism, Marxism and critical theory to introducing a theory of inequality and power struggle in an evolutionary view (Leontjev's activity theory) that fits well with Peirce's evolution theory as it goes beyond Darwinism. From there, it reveals how the discourse theories of Foucault, Fairclough, Laclau and Mouffe, Bourdieu's Field sociology and its four forms of capital, plus Latour's Actor network theory, like Luhmann and Peirce's philosophies, are non-dualistic, challenging the dominant nature-culture mechanist dualism without becoming radical constructivist postmodernist. This non-fundamentalism and non-reductionism makes it possible to triangulate methods and paradigms as the philosophical framework is broad enough to encompass qualitative and quantitative sciences. My case linchpin is global warming and how we create rationality in democratic societies. In this paper, I will discuss in particular, how Peirce, Habermas and Luhmann all contribute to a differentiated view of rationality and information appropriate to the curriculum when placed in Peirce's biosemiotic framework.

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“Language; the Dawning, the Light, and the Dark: Part 1, the Dawning”

The current presentation will consider the development of language as a natural outcome of structural coupling in a community of consensually coordinated organisms. Consensual coordination is observed in most conspecific and some multispecies groups of animals. Where recurrences are adequately reliable to develop a presence as a configuration, that configuration can become the basis of a further coordination. For example, some element associated with the whole configuration such as a sound, motion, expression, etc. becomes a token for the whole configuration so that it serves to initiate and or coordinate the established pattern of coordinations. Maturana speaks of this as the consensual coordination of consensual coordinations; namely a first recursion in consensual coordination. Once the form of cognition appropriate for generating and conserving recursions in coordination is well established, complex behaviour, seen by an observer as language or communication, arises.

In a similar manner, once a complex repertoire of tokens is established in a stable social group, especially one with long maturation periods and the ability to conserve the existing consensual coordinations of consensual coordination inter-generationally, then a further recursion of consensual coordination becomes possible. This recursion can be seen as the consensual coordination of tokens and is developed through distinguishing a token as such and naming it. A name for any configuration (object, behaviour, intention, emotion, etc.) enables communication about something outside its immediate context. A name can be ported into another situation and become the basis for conversation, recounting (story telling) and planning (future stories).

Though the generation of a name entails a coordination of coordinations of coordinations (all of them consensually achieved) in practice once the cognitive process of stepping out of a situation adequately to distinguish and name it is in place, the operation of further coordinations based on tokens or on names becomes possible and is incrementally incorporated in a community or society. The generation and conservation of distinctions and naming thus creates an opportunity for endless expansion and evolution of lineages in language, as indeed is the case for us humans who live in a languaging world.

Note: Though I am well acquainted with some lineages of systems studies, semiotics is not my area of expertise. I am very interested in exploring the congruences and differences between my understanding of languaging and the field of semiotics.

1 This is the first of a series of reflections, grounded in the work of Humberto Maturana, in which I will examine the origins and evolution of language and the consequences of living in language.

“Metastasis of pancreatic ductal adenocarcinoma – convention and fraternization between cancer cells and others”

Metastasis of pancreatic ductal adenocarcinoma – convention and fraternization between cancer cells and others
Biosemiotics initially referred to the communication and to sign-processes between individuals of the same or different species. However, biological and biochemical discoveries and technical improvements within the last decades kicked off an expansion of the perception, observation and discussion about signprocesses not only between but also within organisms. I suggest that human cancer, and here especially the pancreatic ductal adenocarcinoma (PDAC), is an excellent example for different dimensions of cell-to-cell communication within an organism, termed as ‘endosemiosis’. Cells of multicellular organisms communicate with each other by secretion of signal molecules into their environment and by taking up molecules from other cells (or themselves). These molecules include cytokines, hormones and also metabolites. Cell signaling is crucial for the coordination and fine-tuning of the hundreds of different cell types and can initiate, for example, proliferation, differentiation or controlled death (apoptosis) of cells. Looking at cancer cells, they differ from ‘normal cells’ in having genomic and epigenomic alterations, which can lead to uncoupling from several signal cascades, such as the control of the cell cycle and induction of cell-death. This in turn leads to proliferation of the cells. One might ask: do cancer cells still ‘speak the same language’ as the other cells, and if not, how does this changed form of communication change signaling among cancer cells?

Most patients of PDAC, which is one of the most deadliest cancer entities, die because of the overall metastatic burden, the main organ of metastasis being the liver. The metastasis of PDAC in the liver is a complex process and it depends on the communication between cancer cells and their microenvironment: under healthy conditions the hepatic microenvironment drives the cancer cells into some kind of proliferative dormancy¹. However, upon inflammation of the liver, the microenvironment changes: leukocytes and hepatic stellate cells (HSCs) secrete inflammation related signal molecules, which in turn induce the transdifferentiation of HSCs into hepatic myofibroblasts (HMFs). I will discuss how inflammation processes and the influence of HMFs seem to ‘activate’ the cancer cells and thereby promote the formation of metastases. Interestingly, PDAC metastases are characterized by a highly desmoplastic tumor stroma². This means that the biggest part of the tumor, about 90 %, consist of an pronounced extracellular matrix and stromal cells, such as hepatic myofibroblasts (HMFs) that are actually not cancer cells. While this might underline the importance of the tumor stroma, it also suggests that cancer cells themselves might recruit and shape their environment for their own sake.

Cancer cells build their world to fit their needs: Cancer cells have a high energy consumption and it has been shown in different cancer entities that cells of the stromal compartment ‘feed’ the cancer cells, while cancer cells provide other metabolites for the stromal cells and secrete cytokines to sustain their preferred environment³. Furthermore, cancer cells within a tumor cannot be considered as a uniform mass of cells, but demonstrate very heterogeneous patterns of metabolic activity, which additionally implies an exchange of molecules and information between the cancer cells themselves. Taken together, stromal cells and cancer cells within the tumor microenvironment converse via metabolites and cytokines. They seem to attract, support and feed each other, which results in a beneficial conversation or network, even though it leads ironically to the death of the host. This paper’s analysis of this network can contribute to the ongoing discussion about intercellular endosemiosis and its meaning, especially relevant to the field of medical biosemiotics.

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“Epigenetics And Tooth Grinding: From Hyper-Narrativity To Hyper-Function”

Bruxism is a complex automatized bodily sensory (sensu lato)-motor entity, expressed in the form of clenching or grinding of the teeth. It seems to entail two main patho-physiological forms: sleep (SB) and awake bruxism (AB) that differ in their etiology and phenotypic variance. Each type seems to be associated with different contextual emergences, functional expressions and physiological coding, which is why the contemporary dental profession has, begun to conceive them separately. Yet that by no means mean that the two types are mutually exclusive. Quite the contrary - many clinical and neuro-physiological studies (Lavigne et al. 2003) show that the two forms of bruxism overlap to a great degree. Considering that and their common phenotype, this paper will argue that the two forms of bruxism are features of a distributed corporal functionality, or hyperfunction (see the cognitive-perception and neural-network model supported biosemiotic bruxism model – Calic et al 2017). This paper seeks to demonstrate that it is exactly their distinction that makes possible the developmental and the evolutionary understanding of bruxism. Additionally, simultaneous juxtaposing and integrating of both types’ mechanistic and conceptual neurological and biological features presents opportunities for methodological uses of biosemiotics in the theoretical and practical management of bruxism.

The hyper-functional biosemiotic bruxism model serves as an appropriate template to introduce the epigenetic perspective on bruxism; the mechanisms and components of its biological structuring, arising from motor entity’s interdependent ecological, social, psychological, neurobiological, developmental and evolutionary dimensions. Broadly speaking, epigenetics is the study of all processes and features that contribute to the emergence of properties in the origin of the phenotype and its modifications in evolution. It guides cell differentiation, growth, and development of organisms in a multi-ordered (biosemiotic) communication with their environments. In a strict sense, molecular epigenetics represents a methodological approach to the search for epigenetic diagnostic markers. It comprises molecular gene regulation and expression mechanisms at a critical control level that extend the DNA sequence. The paper will present the theoretical and empirical acknowledgements of the link between epigenetics and bruxism. These will include the associations between bruxism and certain epigenetically determined neurodevelopmental syndromes, as well as certain epigenetically deregulated pathophysiological phenotypes (risk factors for bruxism). The paper will further present a study design of research conducted in association with the clinical Institute of Medical Genetics, University Clinical Centre, Ljubljana (Calic forthcoming) which seeks to locate specific epigenetic markers associated with bruxism. This will demonstrate how epigenetic pathways and mechanisms in bruxism fit into the frameworks of the neural network model of an organism and its interaction with the environment (on a theoretical and mechanistic level), as well as with the perceptual-cognitive processing model (epigenetics in its broader sense). It is only through understanding all the levels (from mechanistic to semiotic) of functioning, including its exteriority and context and the associated interactions, that the complexity of an agent’s functioning and an agent’s (hyper)functionality can be understood. On the empirical level such knowledge facilitates new study designs and methodologies, which is emblematic of the fate of contemporary epigenetics.

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“Embodied Metaphor: ethnography of the imagination toward a ritual aesthetic of the childhood memory”

The metaphor, as Peirce proposed, is a *hypoicon* with which opened a processes of complex cognitive semiosis. One of the forms of persuasive, poetic, aesthetic argumentation that the dynamic and elliptical movement of metaphor allows us is the astonishment (*Kalos*) that generates an emotion but also action of transformation through the potentiality of this symbolic empowerment.

In this context, we study a type of metaphoric ethnography that pays attention to the Peircian *Secondness* as a possibility of exercising bodily action through a particular aesthetic fact of infantile symbolism (the rag doll), but now it is generate by the adult woman of today. This symbol works as a pretext to approach memory in *chronotopies* that can be diverse, juxtaposed, intersectional between gender, race, ethnicity, age, social class, religiosity and ideology.

The body of the doll, which in the case at hand is a black rag doll, corresponds to a popular art that has survived the onslaught of globalization, and even configures "speech act" in several languages and semiotics. Besides, the corporality rag doll expresses another logical: visceral, emotional, or spiritual logical in addition to the rational due to the type of this manufacture that allow remember our own body. In fact, both bodies remember, forget, “speak” with silences. It is possible because like purpose Deacon “the conventionality of language is itself a reflection of these iconic and indexical relations re-emerging in the form of relations between symbols.” (Deacon, unpublished. 3).

Many dimensions come into "play" and generate a repertoire of meaningful choices, such as when you touch, choose colors, cut yourself, which we consider significant indexical “stitches.” Besides women, speak about body parts considerate taboo yet in some societies: the genitals and it allow them meditate and empowerment of the sense of sexuality and think about their desires and the health reproductive in the confidence and community synergy. Hence, in this study we asked about the symbolic relations of co-creation between the creator and her creation.

Therefore, from the construction of the indexical metaphorical place, I analyze corporeality, affectivity and spirituality dimensions from anthropology of the senses through the main clues, and evidence, which ultimately are bio-ethnographic data that these symbolic productions offer us. Finally, in light of the metaphoric cognitive capacity, I propose a semiotic model in an iconic, indexical and symbolic dimension applicable to diverse imaginative narratives.

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“Homeostasis, the reflex arc, information and distributed cognition”

The conceptual notion of an organism-in- its-environment expresses a necessary contradiction between the organism and the environment. The organism cannot but be the product of an evolving environment, in which the unavoidable and never-ending recursive interactions of the organism with its subsuming environment, yield the required organism integrity and identity needed for the development of distributed cognition mechanisms. Where distributed cognition in a biosemiotic context is defined as the ability of a self-referencing organism-in-its-environment to interact with its environment to satisfy its physiological (internal and external) and social needs to survive and sustain itself (Cardenas-Garcia and Ireland 2017).

In the 19th century, Claude Bernard conceives the idea of the “milieu intérieur” (internal milieu) of the human organism, which remains stable independent of the physicochemical perturbations in the resident environment (Bernard 1949). During the first part of the 20th century, Cannon coins the term homeostasis to refer to this idea of maintaining a stable internal milieu by means of coordinated physiological reactions. Including the postulate that a stable internal milieu is a prerequisite for the development of a complex nervous system, in the process identifying the sympathetic nervous system as central to bodily homeostasis. Further, the central nervous system aids homeostasis by generating the behaviors that serve physiological viability, e.g., shivering, seeking shelter, and putting on a coat are all examples of homeostatic mechanisms of temperature regulation (Cannon 1929). A notion also shared by Sherrington (Sherrington 1906) and expanded by Richter (Richter 1943).

An engineering interpretation of homeostasis was initially conceived by Rosenblueth et al. (Rosenblueth et al. 1943) and further elaborated on by Wiener (Wiener 1948; Rosenblueth and Wiener 1950), during and after the 2nd World War. Resulting in homeostasis becoming operationally defined as a series of inter-related negative feedback loops in the human body, and considered perfectly consistent with Richter. Also, such responses, whether physiological, chemical or behavioral, were also considered as reflexive or automatic. Ross Ashby, in his book *Design for a Brain* (1952), elaborated on many of these ideas.

This presentation is divided into four sections. First, a review of homeostasis situates the topic and argues for the centrality of its impact. Second, a description of the reflex arc shows the relationship to homeostasis in its actioning and the role of Bateson information. Third, the definition of biosemiotic distributed cognition is shown to be congruent with the actions of homeostasis as expressed in the reflex arc and self-referenced information. Last, the positing that all living beings fundamentally rely on homeostatic reflex actions to satisfy physiological needs shows the pervasiveness of distributed cognition.

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“Sentience and perception without representation: The case of Slime molds”

My interest in this meeting is to propose some transdisciplinary methods that allow the biosemiotics to develop a fundamental role in the multiversality of scientific and human knowledge. Therefore, I would like to begin to contemplate this possibility through the minimal processes of cognition in living organisms.

We are going to contemplate Deacon's concept of sentience in the minimum terrain of cognition in organisms without a nervous system. I have collected the minimum cognitive principles developed in prokaryotes and I have made an extended and compared version for one of the most primitive eukaryotes that exist: the myxomycetes, popularly known as slime molds. These protists have a bridge-like development between multinucleate unicellular beings (*Physarum polycephalum*) and uninucleate pluricellular organisms (*Dictyostelium discoideum*). Their adaptive behaviors have turned out to be the most impressive that has been discovered in these eighteen years of studies. Toshiyuki Nakagaki described in Nature that these organisms had a primitive intelligence to discover the minimum path of a labyrinth, or that they could replace railway engineers to generate the route map of commuter railways in Tokyo. From that moment until today, various investigations have been made on such behavior, the capacity of a short-term and spatial memory, or even decision-making to decide whether to go to a hostile environment where a rich egg awaits or a favorable environment where poor quality oat flakes await you. My work tries to link the sentience of these organisms with the perception of both their Umwelt and their Innenwelt to understand what Nakagaki refers to with the term primitive intelligence, and if this can be combined studies on perception that fit the requirements Intelligence theorists without representation of Rodney A. Brooks applied to the AI. In this way we can offer a point of union between cognitive enactivity and its sentience in non-brain organisms. I will expose future studies on the thresholds of perception - both minimum and maximum. Finally, I will end up leaving open a dialogue about whether this cognition allows to go safely to more committed terms such as “proto-qualia” and “proto-consciousness” among others based on a robust experimental verification and a vigorous biohermeneutics.

Keywords: Sentience, cognition, supervenience, subvenience, proprioception, autopoietic enactivism, biohermeneutics, *Physarum*, *Dictyostelium*.

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“Steps towards the semiotic awareness of biology: Biosemiotics replacing the role of synthetic theory of evolution”

0. Speaking about the future of biosemiotics, it is advisable not to insist on specific events that should happen at some time or a time interval in the future, but rather evaluate what can happen in principle and what is desirable to happen in the foreseeable future without fixing any specific dates. In this case, it is expedient to fix possible points of bifurcation of the development of biosemiotics.

1. Biology will have to master the idea by H.Pattee about a semiotic awareness of biology (SAB), expressed 50 years ago (Pattee, 1968), i.e. create a biology in which biosemiotics will take the place of the synthetic theory of evolution (STE) in modern biology.

2. You can talk about the three modalities of this awareness:

- The reinterpretation of STE in the categories of information theory approaching to semiotics, which was carried out in the 1960-70s.

Restrictions on the value of such activities are due to the impossibility of real calculations of the amount of information in living organisms and the lack of assessments of the quality of information.

- Development of biosemiotics based on the classical semiotics of Ch.Peirce and F. de Saussure, which relies on syntactics and pragmatics (biosemiotics sensu stricto).

- Development of the concept of the biological sense (semantics), the conceptualization of the biological text and the development of the SAB as biohermeneutics.

The first two modalities pretend to the possibility of obtaining operational methods of manipulating living organisms and therefore seem more attractive from a technological point of view, the third modality proceeds from the fundamental variability in the realization of biological meaning, which sharply limits the reproducibility of technical achievements

3. The fact that biological life is located above the semiotic threshold (but lower semiotic threshold in U.Eco's sense; Nöth, 2000), restores the attribution of biology to humanitarian knowledge, radically opposing it to physics and chemistry. This circumstance requires the restructuring of the education system, so that biology again falls into the same group of disciplines as linguistics, semiotics, anthropology, culturology, etc. The latter circumstance does not depreciate existing biology (including STE), but rethinks it (Emmeche, Kull, Stjernfelt, 2002), presenting modern biology in the biosemiotics context as the study of bodies of biological signs (the absence of study of which is a gap in general semiotics).

4. The SAB provides a conceptual basis for many modern biotechnologies and biomedical manipulations such as editing the genome (for breeding and medical purposes), training of animals, immune biotechnologies, psychopharmacology, endocrinology, use of pheromones to exile of insects from the dwelling, sexual pheromones in perfumery or records of voices of birds of prey to dispersal of birds near airfields, giving artificial smell and taste to food, etc. Nowadays, SAB as a basis of biotechnology competes with bioinformatics (first of all in genomics), which has no satisfactory conceptual basis.

5. The biosemiotics can take a key place in NBIC-convergence due the connection between semiosis and information processes, role of biosemiosis in cognitive processes, nano-sizes of signs' bodies of key endosemiotic processes (diameter of DNA is 2 nm, step of spiral 3 nm; size of tRNA, signal oligopeptides, antibodies 5-20 nm). In that case the biosemiotics can be dissolved completely in the products of NBIC-convergence and disappear as independent area.

6. Further development of semiotic realized biology can lead to clarification of the relations between biohermeneutics, biophilology, biolinguistics, biosemiotics and biopragmalinguistics. Depending on intellectual atmosphere, each of these directions can occupy its own "an ecological niche", thus, that one-two of these disciplines will come to the forefront.

7. The totality of the presented material indicates the need to create a SAB system instead of a set of unrelated developments on semiotic phenomena in living organisms. Such a system should include:

- The general scheme of the SAB, including the selection of the main sections indicating their subordination and other interrelations.

- Standard for the study of a biosemiological object (sampling of a representative material, criteria for the quality of description, reproducibility of results, etc.) and a protocol for its study.

- Standard for the description of the biosemiological situation, including a description of semantics, syntactics and pragmatics, involving semiotic concepts of kinesics, haptics, proxemics, etc.

- Systematic reinterpretation of established trends in the study of biological semiotic means (signs) such as genomics, physiology, immunology, ethology, ecology, etc.

- Incorporation into nowadays biosemiotics (in Sebeok's – Hoffmeyer's – Kull's sense) the settled biological concepts of a sign (Darwin's ideas of sexual selection or Pavlov's ideas of conditional reflex and the second signal system).

- Reinterpretation of biosemiotics ideas of old eras (nowadays aren't taken into account as unscientific – plants and animals in mythology, folklore heraldry, fairy tales, fables – cf. ethnobotany and ethnozoology, Biblic botany and zoology, etc.).

- The use of all the semiotic modalities of the relation to time (achrony, synchrony, diachrony, panchrony) to describe living organisms (including their change in historical time, i.e. evolution).

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“Iconic: A semiotic approach to addressing language deficiencies resulting from ASD”

The aim of this project is twofold. The first part consists of a careful analysis of language deficiencies resulting from autism spectrum disorders (ASD). In particular, this analysis highlights how these deficiencies stem from, among other underlying factors, difficulties in forming indexical and symbolic associations; on the other hand, iconic associations seem to have remained intact, even augmented in their absence. Further, I suggest that the deficiencies in higher semiotic processes may contribute to other major difficulties associated with ASD, namely, abnormal or impaired social interaction and pronoun use. The second part of this project proposes a strategy for helping those with these linguistic impairments by appealing to their aptitude for iconism. This entails nesting indexical and symbolic associations within an iconic domain. One possible application of this strategy will be presented in the form of a modified version of the grammar prediction engine, Avaz FreeSpeech. The proposed modifications to Avaz FreeSpeech take into account other successful strategies as well as other complicating factors. One such proposal attempts to overcome the difficulties autistic people have with certain grammatical structures as well as their susceptibility for sensory “overload.” This particular modification will entail using a digital version of art therapy, which has proven considerably effective, in conjunction with a simple spatio-pictorial (non-linear) grammar based upon C. S. Peirce’s existential graphs, and later developments of Peirce’s work in computer logic (conceptual graph theory) by John Sowa. This method of interface will assist with certain pictorial predictions, while also avoiding the cumbersome, even unwieldy image banks which are found in Avaz FreeSpeech. The result will be a program that is much more amenable to the semiotic strengths of those with ASD, helping them to grasp higher semiotic functions in a way that is, in principle, intelligible to anyone regardless of linguistic background or aptitude.

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“The fate of meaning: channeling one’s inner biosemiotician”

This paper will present experiences of inculcating biosemiotics into the teaching of modules across a range of courses in the humanities. Most of this endeavour dates from the mid-1990s, following my attendance at the Berkeley congress of the IASS. Although I had taught semiotics since 1989, my outlook on the nature of the disciplinary field was profoundly changed in the wake of that conference. As well as gaining a sense of the enormity of Peirce’s work (as well as that of von Uexküll, Sebeok and Hoffmeyer), it became clear to me that the poststructuralist orthodoxy that suffused the areas in which I was teaching not only failed to answer undergraduates’ questions but routinely short-changed university students’ experience. Put another way, the nominalist and solipsistic assumptions that underpinned the idea that the entirety of existence is a product of discourse, assumptions that were common in much media and cultural studies, meant that student experience ran the risk of being banished from the classroom. I had not been alone in tending to respond to regular questioning by students with regard to such topics as ‘animal communication’, ‘plant communication’, ‘innate properties of humans’, ‘whether humans really are born as blank slates’ and ‘the continuity of signs across realms of life’ with dismissal – “Those questions are not germane to this subject area” – or deflection – “Those are all matters constructed in culture”. Introducing biosemiotics into areas of teaching on matters of communication, media and, especially, the topic of ‘meaning’, actually started to address questions that undergraduates wished to pose.

This paper will demonstrate the ways in which biosemiotics came to inform modules on communication theory, language, meaning, and narrative, as well as a module on cultural theory which allowed students to focus on the writings of Thomas A. Sebeok for an entire semester. It will attempt to show, on the one hand, that the natural sciences cannot be banished from humanities courses, even if it might be felt in some quarters that that is desirable. On the other hand, it will pose the possibility that biosemiotic principles might inform a teaching ethos, particularly in arts and humanities, by promoting means to enrich and maintain a variegated *Umwelt*. Put another way, acknowledging biosemiotic principles in various taught subjects allows for a meta-pedagogy in which some of the virtues of the higher learning – enrichment, awareness, reflection, analysis and attention to detail – are renewed without recourse to a bourgeois, moral and individualist frame.

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“What makes genes signs?”

Genes, being grounded in a code, are often taken to be exemplary of signs in endobiosemitotics. It might seem that code biology is sufficient to understand genes (it is the paradigm of the theory), but I believe there are problems that require semiotic answers. I will first discuss if and how genes can (might) be considered to be signs given their material nature and their function in biological systems. Assuming genes are signs, I will discuss what they might be signs of (what their object and/or ground is). If genes have a semiotic object, then code biology is not enough to fully explain how they work. I will need to present some background material about the role of genes, how they differ from sequences of DNA, how they are expressed, and how they are transmitted. For one thing, there are sequences of DNA that are in fact transcribed, but are not expressed as proteins, so they are not genes. I will first, for the sake of argument, present a simplified caricature of how genes are expressed and transmitted. Both of these processes are more complex than is commonly supposed, with the very nature of the gene itself not being unambiguous so I will discuss the nature of these complications and any problems this might present for understanding genes as signs. I will put this in the context of how genetic information is transmitted through replication and expressed in traits, for which I have a formal theory involving information channels according to which expressed phenotypic and hereditary traits express information in the genes. This information transfer itself is compatible with code biology. Two major ideas found in the biological literature of what genes represent are traits and environmental characteristics. I will consider the merits of each of these and some problems that arise for them. Unfortunately I will not be able to come to a decisive conclusion about how genes function as, or more strongly are, signs, but I think the issues I raise will lay a ground for future work on this central problem. My feeling is that many other issues in endobiosemitotics have similar problems to be resolved, and that if we can solve these in the paradigmatic case of genes, or at least understand them, then we have also made progress in understanding many other sign systems in biosemiotics.

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“How can a molecule become *about* relationships between other molecules?”

Biosemiotics requires explaining how organisms generate system-intrinsic forms (interpretants) in response to immediate system-extrinsic forms (sign vehicles) in such a way that this reorganizes the system with respect to some non-immediate/displaced form (object) in a way that directly or indirectly utilizes that form to achieve some end. Such a system is an *interpreter* and the specific interpretants it is disposed to generate determine the domain of sign-object relations it can utilize to preserve this capacity and delineate its *Umwelt*.

Using an idealized (but empirically testable) molecular thought-experiment called autogenesis¹ I describe three teleodynamic architectures² that demonstrate a nested hierarchy of interpretive competences loosely analogous to iconic, indexical, and symbolic modes of referring.

Simple autogenesis involves two self-organizing molecular processes—reciprocal catalysis and self-assembly—coupled by virtue of a catalytic byproduct that spontaneously self-assembles in to a capsid shell. Each process generates constraints that constitute critical extrinsic boundary conditions necessary for persistence of the other process. Thus catalysis maintains capsid molecule concentration gradient sufficient to maintain self-assembly and capsid formation restricts catalyst diffusion so that co-dependent catalysts can maintain a high interaction probability. The reciprocity of these constraint-generating processes is itself a higher-order constraint that preserves the disposition to generate the entire system of constraints. The result is a molecular system that can reconstitute itself if damaged and potentially reproduce itself.

A critical semiotic conundrum was insightfully framed by the philosopher David Chalmers. Thus he says: “...physics characterizes its basic entities only extrinsically, in terms of their relations to other entities, which are themselves characterized extrinsically, and so on. The intrinsic nature of physical entities is left aside.”³ In autogenesis each component self-organizing process reciprocally produces an internal “environment” conducive for the the other, making these reciprocal externalities internal with respect to an extrinsic *Umwelt* and creating an unambiguous self/nonself interpretive perspective.

Two slightly more complex variants of autogenesis clarify its biosemiotic importance. If an autogenic system evolves a surface that is selectively weakened by the binding of critical substrates for the contained catalysts, its opening interprets the probability that its environment is conducive to its reproduction. And if an autogenic system contains a non-reactive polymer that serves as a template constraining the probabilities of interaction between catalysts by virtue of the order that they bind to and are released from it, the template molecule acts as a sign preserving the chemical-dynamical constraints that constitute the system of which it is a part. This demonstrates: a. the asymmetric nested dependence of these three modes, b. how an artifact can inherit semiotic properties from a teleodynamic system by “offloading” its dynamical constraints onto its structure, and c. how a molecule (like RNA) can become about other molecular relationships.

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“Zoosemiotics of emotions: A new model and its applications”

The subject of emotions is a complex one to study in animals. Firstly, due to emotions being, for a long time, a subject scientists were not supposed to look for in non-human species: any mention of emotions was viewed as “anthropomorphism”. As a consequence, the field was poorly studied, and we lack data and methodology. Secondly, because the traditional methodology of interview cannot work with animals, the only thing we can rely on is their emotional semiosis. For the last few decades, this was primarily a task for ethologists rather than one for semioticians, but semiotics, and even more so zoosemiotics, have a lot to give to this field.

In this presentation, we would like to give an introduction to our theoretical model of emotional semiosis study. Inspired mostly by Peirce, Eco but also Sperber and Wilson as well as the work of other ethologists, this model is a conceptual tool collection, gradually organized by complexity, and which can be adjusted to the studied species and the type of emotions expected. This model has been built with tools and concepts from both semiotics and ethology, and it would be difficult to tell if it fully belongs in one or the other. However, we designed it to primarily offer a semiotic assistance to the studies of ethologists.

It has already been used in small concrete applications, and more are expected. This model is currently being tested in collaboration with behavioral veterinary physicians as a complementary tool to evaluate the possibilities of reeducation in domesticated dogs showing aggressive behaviours such as biting. Behavioral veterinary students in Lyon University have received an introduction to the model in order to help their field with some pathological behaviours in pets. Another collaboration program is currently beginning, combining semiotics, ethology and psychology in experimentations about the education of therapy horses for mentally disabled children or post-traumatic stress disorder victims.

Lastly, another collaboration is in preparation. The application will be, this time, a study in the wild. Our aim is to study wild packs of wolves, with a complete team of researchers, in the north of Portugal. The main purpose of this team is to study the predatory behaviour of wolves on the local wild horse population, but we especially would like to study the social interactions between group members, using our model of emotional semiosis, in order to better understand hierarchy, emotions, behaviours and cognition in wolf packs.

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“Extended synthesis paradigms in biology, neurophysiology and artificial intelligence”

The evolutionary theory, articulated in early XXth century biology on the basis of Darwinian theory of natural selection and Mendel’s genetics (cf. J. Huxley, *Evolution: The Modern Synthesis*, 1942), is one of several greatest contemporary paradigms that continue to dominate today’s epistemology.

However, the discovery of a number of internal (organismal) and external (environmental) factors of epigenetic inheritance, due to further biological studies, opened the way to new conceptualizations not only in natural sciences but in philosophy and engineering as well. In this context, the phenomenon of cellular differentiation (particularly in neurons) could be viewed as one of epigenetic mechanisms of adaptive evolution, not only and not entirely biological (that is structural) but, in humans, primarily cognitive and neurophysiological (that is functional), leading to the appropriate organic changes (directly inheritable, or offering indirectly some advantages in natural competitive selection). These conceptions (of quite different disciplinary and national traditions) interfere with the D.S. Wilson’s and E. Sober’s “multilevel selection theory” (1994): the theory of epigenetic evolution is being extended from the level of genes and cells to those of organisms and populations.

For example, French neurobiologist J.P. Changeux distinguishes two types of such neo-darwinism: a “neural” one (“epigenetic”, or “connective”), biologically compatible with the development of inter-neural connections in embryonic and early postnatal periods, and a “mental” one, related to the continuous production-destruction of synaptic contacts, literally correlative to the dynamics of individual’s mental activity, memory processing, sensory-cognitive synthesis, and other higher neural functions of higher mammals. In this model, the mechanism ensuring the life-long plasticity of the brain, due to its structural and functional reconfiguring capacity (permanent synaptic transformations), could be recognized as a kind of epigenetic mechanism of directly or indirectly inheritable individual evolution results (E. Deyneka, “Frantsuzskaya neurofilosofia” [French neurophilosophy], in: *Current issues of neurophilosophy*, 2016).

Another epistemological branch, which was (unexpectedly) affected by the neo-evolutionist trend in the domain of natural sciences, is the artificial intelligence mimetic and analogous modeling. Here, the initial idea of evolutionary approach belongs to A. Turing, with his concept of “baby machine” capable of continuous development (1948). Later, when the first neurocomputers came, two approaches, similar to what happened to the neuronal darwinism in biology, have been developed. The first one, based upon the classical artificial neural networks theory, was alternative in respect to the traditional algorithmic computation. Another one, of the second degree, so to speak, used a biological evolutionary metaphor of ‘genes’, ‘genotypes’ and ‘phenotypes’, artificial ‘embryogeny’ and ‘development’. Within this second “evolutionary”, in particular “genetic”, computational and robotic modeling paradigm, two other approaches were developed – direct (genotype-phenotype direct mapping) and indirect (encoding not a concrete genotype-phenotype pair but a common principle and a set of rules to evaluate the success of neural network “adaptive behavior” in each task), metaphorically and analogically compatible with the biological and neurophysiological “epigenetic” models.

Beside the methodological issues (the evidence of emergence of a multidisciplinary epigenetic evolutionary paradigm in contemporary epistemology), the major interest of comparing these three extended evolutionary syntheses – in biology, neurophysiology, and artificial intelligence – is to see how all of them are confluent in the field of neurophilosophy defined, in its turn, as an actual state of the philosophy of mind. In this perspective, a semiotic analysis is called to evaluate the relevance and implications of the “epigenetic model” extension to the semi-biological and non-biological areas, such as neurosciences or artificial intelligence computation and robotics, respectively.

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“Quantum origins of ontic emergence”

For the past half century, substantial progress has been achieved in exploring various modes of multi-level emergence in nonlinear dynamical systems (Kauffman, 1993). However, such emergence has typically been viewed as merely epistemic and, via supervenience concepts, mostly reducible to physics substructure—substantive models for genuine novelty at higher levels, or ontic emergence, have remained elusive. Recently, research deploying a combination of category-sheaf theoretic tools, the decoherence approach to quantum physics interpretation, and philosophic analyses of *potentia* has enabled a new route to understanding ontic emergence. Rules of transition emerge from the local to the global and conversely such that global event structures are consistently maintained and augmented; concurrently variable local Boolean frames [providing simple yes-no logic with the principle of the excluded middle] contextualize the actualization of events, and “each new actualized event creates a novelly integrated whole.” (Epperson and Zafiris, 2013, 344). Overall, this quantum-based scheme encompasses the inclusion of several seemingly incompatible dualities (input-output, local-global, quantized-continuous, actual-potential, among others), which are found to be mutually implicative at a deeper level. Our analysis reveals that it is impossible to conceptualize one principle within such dipolar pairs in abstraction from its counterpart principle. Such category theoretic analysis provides a rigorous mathematical means for “relating relations,” for explicating the role of potential relations and context in quantum processes, and for the localization of quantum observables with respect to local Boolean contexts. Indeed, for any quantum system, and thus for any physical system, such context specification is essential because the only closed system, if that, is the universe at large. Consequently, full analysis of any physical system necessarily goes beyond the dyadic relation of input-output to the triadic relation of input-output-context. Philosopher James Bradley has stated that three of the most fundamental questions of ontology are that of (1) origin, (2) difference, and (3) order. Pre-given facts and *potentia* provide the ‘origin’ (Peircean firsts), basic quantum processes of input-output yield the ‘difference’ (Peircean seconds), and such process, with its actualization of *potentia*, inevitably requires (at whatever scale) local Boolean context, thus the Peircean triad, input-output- context, and resultant ‘order’. The methodological goals of reduction and context independence can often represent good approximations, but inevitably just that—never strict entailment. At multi-scale, physical constraints and relationships, all emergent from fundamental quantum process, enable high levels of determination, yet there is inevitably a context, some delimitation of possible constraints, and real (non-Boolean, pre-space?) *potentia* that are part of ongoing processes, at whatever level/scale, the actualization of events —“one darn thing after another.” Semiotic relations involving an ‘interpretant’ may be limited to biosemiotics, but triadic relations are fundamental to quantum process, and thus to all natural systems.

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“Creation of the relevant next: How living systems capture the power of the adjacent possible through sign use”

Stuart Kauffman’s signature notion of the Adjacent Possible as an organizing principle in nature shares much in common with logician Charles S. Peirce’s understanding of the universe as an ever-unfolding ‘process ontology’ of possibility space that is brought about through the recursive interaction of genuine possibility, transiently actualized order, and emergent (but never fully deterministic) lawfulness.

Proceeding from these three fundamental categories of becoming-as-being, Peirce developed a complimentary logic of sign relations that, along with Estonian biologist Jakob von Uexküll’s action-as-meaning imprinting *Umwelt* theory, informs the work that is currently being undertaken under the aegis of Biosemiotics.

In this talk, I will highlight the deep affinities between Kauffman’s notion of the Adjacent Possible and Biosemiotics’ hybrid Peircean/Uexküllian “sign” concept, by which living systems, both as individuals and in the aggregate (i.e., as co-actors, communities and lineages) “capture” relevant aspects of their relations with their immediately given reality and preserve those schemata for negotiating future interaction possibilities in the form of biologically instantiated *signs*.

In so doing, living systems move into the Adjacent Possible by “collapsing the wave function” of immediate-next possibility not just probabilistically, but guided by system-internal values arising from previously captured sign relations that have become biologically instantiated as *replicable system biases and generative constraints*.

The influence of such valenced and end-directed action in the world, in turn, introduces into the universe the phenomenon of the Relevant (and not just deterministic, or even stochastic) Next. My argument in this talk is that organisms live out their lives perpetually confronted with negotiating the omnipresent *Relevant Next*, as informed by the biological capture of their (and their lineage’s) previous engagements in doing so.

And because such “capture” of previous agent-object-action relationships are instantiated as biological signs for the guidance of the organism, not only are “successful survival strategies” within a given possibility space captured (as in traditional accounts of Natural Selection), but captured as well within those sign relations are the entire complement of previously untaken but still veridical real-world possibility spaces that are inseparably ‘entangled’ with that sign, and that lie in wait for potential exploration by the organism and its lineage.

Thus, while all action in the universe is both current-context dependant and next-context creating, the emergence of ever-more complex semiotic capabilities in living systems has expanded the possibility space of immediate-next-action in the world exponentially, and has brought into being not a pre-given, singly end-directed ordered world, but the emergence of many ends-directed world of promiscuous, unforeseeable and interacting *telos*. The goal of Biosemiotics is to understand and to explore this world.

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“Not that there’s anything wrong with plumbing”

Since the teaching and creation of my very first biosemiotics class in 2002, I’ve become used to students’ feedback of the “blew my mind/opened my eye/changed my life” type of histrionics (quite possibly due to the fact that my teaching style is a bit histrionic in itself), and yet, over 15 years into the endeavour, one of my favourite student evaluation comments remains this one from 2011: “I am a fourth year biology and pre-med student and I want the university to tell me why I had to wait till my last class in my last year to find out that biology is not just a kind of applied plumbing.”

With, I guess, one of the longest continuous track-records in teaching biosemiotics (outside of the University of Tartu), I have, over the years, developed a number of different teaching materials that I’ve found useful in introducing to my students the concepts of Uexküllian *umwleten.*, Peirce’s icon-index-symbol trichotomy, the Hoffmeyerian *semiosphere*, and Deacon’s notion of symbolic reference, as well Waddington’s notion of the epigenetic landscape and Bateson’s distinction between *pleroma* and *creatura* – a few of which I will be sharing in the session.

But in all cases, I have introduced these ideas in the context of a traditional “biology” class (though one pitched to a mixture of both science and humanities faculty majors, as all of the classes in my interdisciplinary “scholar’s programme” are). As such, this extremely demanding class, for both students and teacher, also covers – at least on the introductory level – origin of life theories, Darwinian and non-Darwinian theories of evolution, developmental biology (esp neurogenesis), protein synthesis, apoptosis as an organizing factor, a good number of lectures on the neurobiology of perception and memory, and, in the final weeks of the module, the concepts of symbolic reference and the social co-construction of knowledge and selves.

In short, by teaching biosemiotics within the context of a “Biology 101” type of course I have, I feel, at least taught students some fundamental biology (which is the level at which my own knowledge of biology ends) with just enough “thought-provoking” biosemiotics thrown in to get them excited, ideally, about studying more of both – or at least not seeing them as opposites.

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“From umwelt to me(n)tabolism: Re-Mapping the mind-body problem within endo- /exo-perspectivism”

One central and persistent problem in philosophical accounts of human mind and consciousness is the attempt to heal the ‘Cartesian Cut’. Diverse and divergent theories about the relationship between mind and matter continue to proliferate, but a meta-theoretical dependency on the methodology of laboratory science within the philosophy of mind leads them to deflate or deflect the challenge posed by subjective experience.

Instead of first creating theories of mind and then confronting them with the issue of subjective experience, I propose to treat this challenge as our starting point. My first step is to take apart the mind-body problem by developing a schema of endo- and exo-perspectives, drawing on the thought of Jakob von Uexküll and Maurice Merleau-Ponty. In a second step, I sketch a new path towards putting it back together again by identifying parallels between conceptual aspects of metabolism, the structure of the endo/exo schema and some of the holistic characteristics of subjective experience.

Many attempts at dealing with the mind-body problem appear to be implicitly based on a misguided variant of naturalization, which hypostasizes the methodological exigencies of specific scientific fields and derives its philosophical commitments from the technical strengths and limitations of the associated experimental work. This holds to some degree for the relationship of functionalism to psychology, some variants of materialism to neuroscience and 4E cognition to the increasing experimental inclusion of environments and (robotic) bodies. The problem here is that, since subjective experience is not accessible to external observers, there is no real place for it in such exo-accounts. Worse, they generate concepts of mind which are decoupled from subjective experience, rendering the mind-body problem unintelligible or intractable.

In contrast, endo-perspectives which start with subjective experience are developed by von Uexküll and Merleau-Ponty. Teasing out the tensions between these two very different approaches and developing them into a rigorous endo/exo schema provides us with a powerful intuition-pump. For example, Uexküll's exo-description of a meadow in which he places like vibrant drops of imagination the experiential endo-umwelten of different animals casts strong doubts on the idea of extended cognition: two spatialities are poetically superimposed by von Uexküll, but the fact that mind in the endo-perspective spans open all the world does not give it an inch of exo-extension.

Considering the peculiar characteristics of the endo/exo schema in light of bio-philosophical accounts of metabolic processes as described by Hannah Landecker may provide a different hold on the relationship between mind and matter. Claude Bernard showed that organisms are not furnaces which burn food, but instead they create an internal milieu which constitutes a nutritive reserve and allows higher degrees of autonomy from food sources. Similarly, we can understand the nervous system not as processing information about the world but as creating an internal umwelt, a ‘cognitive reserve’ which enables self-reproducing dynamics by providing relative, temporary shelter from external perturbations. Hans Jonas’ conception of metabolism as a processual boundary which does not merely connect inside and outside but constitutes them in the first place can help explain why the endo-perspective is inherently monist, while the exo-perspective produces only dualisms - even though many exo-accounts are in denial about this. This lively conceptual exchange at the boundary between biology and philosophy I call mentabolism.

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“Biosemiotics, two naturalisms and the divided vertebrate cerebrum: It’s about time and triadicty”

Lee Smolin has proposed the distinction between an atemporal (or ‘timeless’) and a temporal naturalism based on fundamental considerations linked to theoretical physics.¹ In ‘conventional’ timeless naturalism—or *Naturalism One* using Smolin’s identification scheme—there is a sundering of the temporal continuum into distinct points in time rendering the flow of time effectively illusory and raising the possibility of fundamentally unresolvable dyadic binaries such as the famous paradox—among several others—posed by Zeno of Elea in which fleet-footed Achilles will never overtake and pass the lumbering tortoise to reach the finish line first—a totally non-intuitive scenario! Furthermore, in this timeless deterministic context, free will is illusory—an illusion that may well itself be an illusion that follows from timeless *Naturalism One*. In this currently dominant Western world-view—informed by the ‘Way of Ideas’²—nominalistic ‘necessitarianism’³ reigns supreme in the form of the ‘Cartesian Myth’ as the focalized external object is disconnected from its surround and dissociated from the subjective being of the organism. Perception occurs in separated discrete steps, and semiosis is effectively ‘digitized’, occurring in a self-referenced manner and rendering the organism an internally constructed observer of its environment, fully distinct and totally estranged from it. In temporal naturalism—*Naturalism Two*—time remains a continuum and *possibility is real* in total concordance with the ‘synechism’ of Charles Sanders Peirce.

In this paper, the Triadic Analogue-Digital-Integrative Cerebration (TriADIC) hypothesis will be presented in which the two cerebral hemispheres of the vertebrate brain are each linked to one of these two ways of contextualizing the world. In the conceptual framework developed by Iain McGilchrist in his book titled ‘The Master and His Emissary’ (2009), the two vertebrate cerebral hemispheres subservise the need for the organism to do two things that cannot be done synchronically within the same system: (1) distinguish and identify objects of potential interest within its environment nominally distinguishing them from their background surround—a sampling mode corresponding to Peirce’s Second ‘phaenescopic’ category, while simultaneously (2) continuously monitoring ongoing activity globally so that focal attention can be interrupted and shifted as needed for survival and reproductive purposes—for example, when a predator sneaking up is detected or an attractive potential partner appears on the horizon—a mode corresponding to Peirce’s ‘Firstness.’ Two distinct forms of semiosis distinguish between these two functions: a discrete form and a continuous form, respectively. Critical to the ongoing existence of the organism is the diachronic coordination between these two distinct but interdependent systems that occurs via callosal and subcortical signaling that connect the two hemispheres together into a singular integrated agency—a function corresponding to Peircean ‘Thirdness.’ The broader implications of this hypothesis will be examined.

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“Octopus communication informs the Cuban Missile Crisis – Gregory Bateson in 1962 in the prehistory of biosemiotics”

The center of my discussion is a letter dated October 25, 1962 from Gregory Bateson to the pioneering cyberneticist and neurophysiologist Warren McCulloch.¹ I found this letter in the Gregory Bateson Archives in the section on “Octopus.” It comes from a period in which Bateson kept octopus at his house in California to study their social lives and communication. (This research was never published.) In his letter to McCulloch, Bateson briefly sets forth his theory of nonlinguistic, “in large measure analogic,”¹ animal communication. This kind of communication forms the other half of what Hoffmeyer² calls “code duality,” and is probably lesser known or researched, even today, than what is often called digital communication, i.e. human symbolic language. From the letter it is clear that Bateson felt that a particular style of analogic communication is not merely characteristic of animals who do not possess digital language. It also serves as the template for communication about relationship patterns among human beings and even nations, even though the latter have symbolic language in their repertoire. The type of analogic communication in question involves part for whole coding and the absence of formal negation. It is manifest only in a sequence of actions and can misfire. For example, it establishes a state of relative “trust” via the sequence of an analogic mention of violence and then a demonstration that this violence will not take place. Bateson brings up examples of this in octopus and in a hunter-gatherer peacemaking ritual (that of the Andaman Islanders described by Radcliffe-Brown³), before analyzing the then-current Cuban missile crisis in these terms. He acknowledges the use of game theory and Prisoner’s Dilemma in analyzing such situations but proposes that understanding analogic animal communication should more precisely illuminate the mechanisms by which peace-making can emerge “not through deterrence but through the discovery of trust.”¹

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“Diminishing dualism in a world of difference”

The Cambridge (UK) Declaration on Consciousness proclaimed on July 7, 2012, at a Conference on Consciousness in Human and non-Human Animals stated that the absence of a neocortex does not appear to preclude an organism from experiencing affective states, and that non-human animals have the neuroanatomical, neurochemical, and neurophysiological substrates of conscious states along with the capacity to exhibit intentional behaviors. In short, it states that there is natural intelligence, and, by implication, ‘mind in nature’. The Declaration marks a significant shift in concepts of dualism supported in western science. A few years later the public showed its interest by pushing to the top of non-fiction publishing lists books about the hitherto abstract notions of biocommunication, that is to say books about real communication as an aspect of the life of trees, examples of affectivity in the hidden life of animals, and relational cognition in the life of fish. For Biosemiotics the Cambridge declaration did not go far enough.-especially among those inspired by Gregory Bateson. They had already proposed many years before that there are real world patterns to which natural intelligence responds and that the grasping of these real world relational patterns are more significant than apprehension of objects, either concrete or abstract. In short, the “pattern is the thing.’ Patterns are connected to each other at many levels and in many contexts. The grasping of difference in pattern is through abduction. Abduction is a substitute for logical typing inherent in the logic of mathematical sets - which Bateson in his mid-career had himself used to discuss pathology in human communication. Instead, abduction enables apprehension of ‘difference’ in patterns. There is a second order level of abduction where patterns of “similarities of difference,” and the “difference of similarities’ occur. Such clusters of differences become compressed, and further abstraction enables learning about clusters of difference (contexts). Perceptual recognition of such clusters arise through synchronicity or through rhythms of repetition in a surround of circular communications. These ordering properties are only partly related to a physical base in time or space, though some form of physical circuit must be available for communication to occur. Nevertheless, neither empirical nor deductive reasoning from data sets are sufficient to resolve the means through which natural intelligence grasps meaningful patterns. Further, connection in natural intelligence is often indeterminate and does not follow principles of isomorphism, reversibility, identity and hierarchy present in statistics or other conventions of mathematics without significant reformulations. Instead, the attribution of meaning (which also entails attribution of value) to mapping of difference provides integration of local patterns of ‘difference.’ This ordering process includes the mapping of multiple levels in a heterarchical order rather than hierarchies of form; Other contrasts to the sorting of physical or logical types that this paper will address are why refusal and negation in relational ordering of natural intelligence is different from a sign of ‘not’; how parts in the mapping of communication are informative of the whole and how the whole is integrated in parts, so resisting fragmentation; evidence of downward along with upward causation in perception; the irreversibility of communication evident in processual transformation of animate ‘mind;’ and bioentropy. Sources include Luis Bruni’s discussion of heterarchy contained in a recent journal of *Biosemiotics*, Yair Neuman’s recently published book on mathematics and natural intelligence, and my own 2016 publication, *Upside Down Gods*, a discussion of Bateson’s world of difference.

“Supernormal stimuli and human (d)evolution: A study in the architecture of akrasia”

In *The Study of Instinct*, Niko Tinbergen waits until the last few pages to conjecture whether his ethological findings have purchase on human beings. His answer to this question is a resounding “yes.” Even so, already in 1951 Tinbergen was sensitive to the psychologists of his time, who thought that if they acknowledged in humans automated chemical processes, the work of the basal ganglia, or operant conditioning, they would be admitting that humans are no better than animals. In other words, the real danger than humans can be influenced (almost to the point of being “controlled”) by manipulating instincts, seems to jeopardize the rightly honored role reason plays in giving humans a special sort of freedom. And yet, Tinbergen’s own experience as a (rather well-fed) prisoner of a Nazi concentration camp during the occupation of Holland, led him to write, “everyone who has lived through periods of real starvation knows how relatively weak reason is when it is up against really powerful instinctive motivation.”¹ In this acknowledgement, Tinbergen contributes an important environmental component to Aristotle’s classic discussion of the struggle between reason and desire, with appetite or drive defeating reason in akratic individuals.

Deirdre Barrett’s recent book *Supernormal Stimuli* picks up where Tinbergen left off. In reference to Tinbergen’s experiments showing that oystercatcher birds would incubate a single fake but much bigger planted egg than their own modestly shaped and specked eggs, Barrett writes, “[w]e are the one animal that can notice, ‘Hey, I’m sitting on a polka-dotted plaster egg’ and climb off.”² In the domain of biosemiotics ethics, my paper explores how organisms’ environments impinge on their ability to act freely, and constrain or enable their ability to generate open-ended rather than predetermined meaning. Specifically, I argue that humans and other organisms are semiotically “cued” by our surroundings to behave in certain ways rather than others, to remember certain possibilities and advantages or to be denied access to this information, and so on. This presentation focuses on how the particular and peculiar cultivation of human-constructed umwelten, far beyond any niche construction other organisms exhibit, must take the porosity of self and environment into account in order to avoid human devolution.

The infrastructure of globalized industrialization, I claim, has been erected with little thought to engendering creative affordances for humans and the more-than-human world, in the enmeshed identity sense. Recent ecological evolutionary developmental biology research on “holobionts” views organisms as collectives of bacteria and other organisms (e.g., “internal” fungi, amoebas, viruses) that constitute the larger organism (e.g., “the human”) as the relevant unit of evolutionary selection. This suggests that failing to attend to these symbionts in planning our artificial environments may have severe deleterious effects on the hosts (i.e., us). In addition to this biological “innenwelt,” as every biosemiotician knows our umwelt also composes us, with a bevy of scaffolding of certain elements necessary for healthy function. Humans are “cued” by external stimuli, such as volatile organic compounds in the air and community members, but not necessarily in predictable ways.^{4,5} As certain artificial elements in our quotidian environment have replaced evolutionarily natural ones, our instincts have become overwhelmed and addicted to these new supernormal substitutions, but at a grave biopsychosocial cost.

This suggests that any project attempting to wholly artificially recreate or replace the rich complexity human organisms experience in the wild is misguided. Such projects attempt to semiotically capture in 2D what is occurring in 3D. Our epistemological limits prevent us from understanding the entire semiotic story at play; our physical limits prevent us from creating an exact replica or simulation where the map is the territory. Artificial environments created in the west and now globalized in the last century, overlook the ecological basis they derive from, and in which our instincts evolved.

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“Meaning and biosemiotics”

I remember how surprised I was and still am about this discussion of thresholds which came up at the workshop in Kassel a long time ago (2001). To me it seems like a remnant of Saussurian thinking. It goes like this:

Until recently we had a safe threshold called human language. Then unfortunately the biologists told us that at least the higher primates exhibit well-developed cognitive communication that deserves to be included as being semiotic in nature. So where then to put the lower threshold?

Let me admit: I dislike the whole notion of a lower threshold, and would point to the first living cell as the decisive lower threshold, if I had to use this notion at all. In my paper in *Semiotica* 2013 on the idea of the semiome I wrote: “Considering how intimately connected agency is to “being alive,” it appears that agency must be part of the complex puzzle of the origin of life – and...., by implication, the origin of life question cannot be treated in purely chemical terms.” Hoffmeyer 2014.

Then at the meeting in Saka, Estonia, in 2006 Terrence Deacon suggested the notion of a threshold zone, below which everything was purely abiotic and a-semiotic, but above which we had a living, full-blown semiotic cell. In the paper we published together after the meeting we wrote: “We introduce the concept of a semiotic threshold zone and analyze the concepts of semiosis, function, umwelt, and the like as the basic concepts for theoretical biology” Kull et al. 2009. To me this solved the threshold matter once and for all.

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“(Bio)semiotics of food: Producing, preparing and consuming food beyond an anthropocentric frame of reference”

Saussure declared in his *Cours de linguistique générale* that his semiological analysis of linguistics could eventually be extended to other cultural phenomena. We could say that the semiological analyses of food that followed – notably in the writings of Roland Barthes, Claude Lévi-Strauss and Pierre Bourdieu, who all proposed innovative interpretations of food – had two key effects. On one hand, these analyses became an exemplary model of research for (human-cultural) sign studies (it would not be an exaggeration to state that at the dawn of structuralism, *sémiologie* was tied up to food and eating). On the other hand, this research grounded (at least in part) what eventually became contemporary food studies, that eventually branched off into a distinct field of research.

Recent studies in semiotics show that the interest by semioticians for food as a research object has not disappeared. However, these studies also show that semiotic interpretations of food are still primarily conducted through a human-cultural lens. How could a biosemiotic perspective shed a different light on food? Or what could a biosemiotic perspective on food entail? These questions have been addressed by Fabio Parasecoli in “Savoring semiotics: food in intercultural communication” (2011) Adopting a resolutely interdisciplinary approach to food, Parasecoli writes:

we could interpret food as a realm of nature where choices about ingestion interact both with the physiological facts of nutrition, the cultural aspects of signification and communication, and the social structures of production, distribution, and consumption. (647)

Explicitly referring to biosemiotics, cultural semiotics and sociosemiotics, and referring to the concepts of semiosphere and *Umwelt*, Parasecoli then adds

In other words, organisms are always trying to make sense of an environment that is already influenced by their very effort to account for it [...]. Substances become signs when organisms relate to them in a certain way, ingesting them and integrating them in their food semiosphere, which in turn is transformed since its internal relationships have mutated. Moreover, these transformations can also interact with the external world, suggesting that “nature” is also culturally constructed and hence subjected to semiosis. (649)

I propose to build up on these ideas. In the wake of recent research done on the links between biosemiotics and the humanities (Favareau et al. 2017, Hope 2017), the biosemiotic perspective I will refer to is large, encompassing both human(-cultural) and other-than-human(-natural) sign processes and relations in their intricate co-construction. I will focus especially on the intentionality/agency of the living things we humans eat and the issues such intentionality creates in food webs.

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“Design for galactic life on earth”

The natural world has been an inspiration for architects since antiquity, with biology becoming a key influence on design thinking at the turn of the C19th; when the analogical influence turned to interest in how biological systems develop and evolve (see Mertins, 2007). Coupled with the computational capacity to simulate natural systems architects are today exploring the self-organising and emergent morphologies of biological phenomena to rethink how buildings and cities are designed (Coates, 2010 and Ireland 2017). The melting of biology into architecture is most apparent in schools of architecture, in which students are encouraged to explore design from a biologically informed perspective to motivate innovative design solutions.

This paper presents a research oriented architectural design studio at the Kent School of Architecture in which biosemiotics plays a fundamental part of the philosophical envelope within which students of architecture are encouraged to explore architectural scenarios and make propositions that work “From Life to Architecture”. Students explore the relation between an organism and its environment to investigate architecture as the moulding of forces to influence life in a desired direction. This studio considers architecture the crystallisation of environmental energies, harnessed and directed into forms by a scientist-architect; who is perceived to deal with forces not objects. Students are prompted to articulate the dynamic correlations between objects, environment and human experiences, through analogue and digital methods, in a manner that recognises the creative propensity of life and to capitalise on its self-organising and emergent properties.

Instigated five years ago at the Leicester School of Architecture, under the banner “Motive Ecologies”, the studio transferred to the Kent School of Architecture, and continues under the title: “Design for Galactic Life on Earth”. “Galactic” refers to the unusual or extraordinary; that which is not known, or is to be imagined, but having been realised transforms understanding. The galactic (re)informs perception and sensibilities. It is the realisation of the potential. Taking a correalistic approach (meaning: actuating the relations of and between interacting forces) students are encouraged to ignore the boundaries that separate artistic genres, and distinguish scientific information to inform an approach to generating architectural scenarios that seek to define propositions that unite the arts, science and technology through architecture.

Embracing the correlation between an organism and its environment as a global system of complex reciprocal relationships students explore “life” as a process of communication and signification - perceived as continuity and nucleus of possibilities, constituted through and by space and time. Examining cases from art, architecture, science and philosophy the studio strives to articulate architectural propositions that express living conditions and emphasise coordination of heterogeneous elements, forces and tensions inherent to conditions of inhabitation.

The paper will describe the theoretical discourse and how biosemiotics is fundamental to the studios philosophical envelope and demonstrate how this philosophical envelope translates into architectural scenarios and student projects.

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“A biology-architecture spanning review of ‘space’ and ‘information’.”

This paper reports on a conceptual review of two key terms “information” and “space” and how they relate to the constructs built by organisms (human and non-human). Carried out by an architect and a biologist, this review is underpinned by a biosemiotic point of view, and strives to provide definitions that span biology and architecture. The aim is to establish a framework within which interdisciplinary exchange may be better served, with the view that this will aid better cross fertilisation between disciplines, working in the areas of collective behaviour and analysis of the structures and edifices constructed by non-humans; and to facilitate how this area of study may better contribute to the field of architecture. We then use these definitions to discuss the informational content of constructions built by organisms and the influence these have on behaviour, and vice versa. We review how spatial constraints inform and influence interaction between an organism and its environment, and propose how a qualitative approach could enrich understanding of organism-organism-environment relations.

This review came about because biologists and architects have starting coming together to form a new community, interested in understanding the construction mechanisms used by social insects and their potential applications in human-made structures [1, 2]. As is to be expected between two disciplines that have existed in parallel with little interaction, terminology quickly became the first obstacle to creating a theoretical framework in which to ground this emerging field. During discussions preceding the writing of this paper, the authors identified three concepts in particular that rendered their mutual understanding difficult: architecture, space, and information. In this paper, we will first try to reconcile the somewhat liberal use by biologists of the concept of architecture with the more institutional definition that architects have of it. We will then discuss the concept of space in architecture and biology, and how social systems use space both as a source of information and a means to encode social information. Finally, we will discuss the definition of information itself and the effects of architecture on information flow and processing in social systems.

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“Interactions of humans and chimpanzees in laboratory environments”

The primary aim of this presentation is to take a biosemiotic reinterpretation of recent studies on social cognition of chimpanzees in the fields of comparative psychology and cognitive ethology. The heterogeneity of interpretations of social cognition abilities in chimpanzees is striking, and calls for elucidation (cf. Tomasello¹ and de Waal²). Whereas it is sometimes acknowledged that emotional engagements with keepers enhances social understanding in young chimpanzees, the role of laboratory routines and research goals is almost entirely neglected. What follows is a biosemiotic framework that helps us to understand mutual relations in a triangle of individual animals – keepers and researchers – captive environment.

It was decisively formulated by Hediger and Lestel, that social and cognitive abilities of particular animals can be only revealed in direct interactions with a human researcher. If animals are studied in laboratories, the influence of particular humans on their task performance is permanent. The effect was well documented during language experiments with human-fostered chimpanzees. We will argue that studies of the species in captivity are cases of *interspecific* cohabitation rather than intraspecific social cognition.

A tri-constructivist³ and a novel three-fold model will be used for analyzing these interactions. These models reflect a multi-directional nature of interactions in laboratories: interpretation of a cognitive world of a given species is influenced by the ontological commitments of a particular researcher, and his scientific report reflects behavior of individual animals living in laboratory settings devised by the same researcher. In this presentation, we wish to reconstruct a biosemiotic framework of mutual dependency between social structures of chimpanzees, laboratory environment, relations to a researcher, and his ontological commitments. The heterogeneity of laboratory findings can be properly understood only in these spatio-temporal and cultural-scientific coordinates.

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“General Theory of Meaning”

As physics inches towards the notion of the universe as an information system, a general theory of semiosis is a basic link in this chain of knowledge about reality. This paper deals with semiosis and asks, what is it? What are its processes? And what are its effects? Moreover, where does semiosis fit in the great puzzle of the universe. We start from the hypotheses that semiosis is co-essential to life, in general, regardless of whether it is human, animal or in the context of communication or not. We propose information is meaningless in itself and only acquires meaning through life processes. Our theoretical model for semiosis rests upon an information model of the universe, coherently with the latest advances in physics. We also rest upon an evolutionary model of life. We attempt to show how semiosis arises out of communication, evolves into communication and then, through art, into language.

Subjects have different kinds of interactions with other subjects and / or objects; and these interactions may or may not affect, in a hindering or conducive manner, the configuration that the will of the subject strives to preserve. That is, some interactions actively promote the survival or demise of the subject, while others don't. But some of the interactions that do not directly affect the survival have a typical relation in time with the ones that do, so that a subject may come to expect one to follow the other; this is what we call meaning, the expectation that a subject has that some latter and more consequential –for the subject's survival– interaction will follow a present and less consequential interaction.

Thus, meaning is a function of life and, so, information has no meaning in itself and no meaning for objects, it only has meaning for subjects; meaning is most surely one of the first and main evolutionary adaptations of living organisms. Since their goal is to preserve their form and not to know or understand the universe, their whole sensory apparatus evolved to anticipate consequences conducive or detrimental to their survival, as well as to avoid expending precious resources in dealing with inconsequential situations. So meaning arose in the universe as the function of associating a presently perceived configuration with an actual typical future state such as nourished, harmed, reproduced, etc. This can be expressed as our Theory of Emotional Response.

TER: To a typical individual of a given species, the perception of a given typical configuration elicits a typical and predictive emotional response, defined by the evolutionary need to seize opportunities, avoid harm and conserve resources.

Objects and subjects are not truly concrete –closed and independent– systems, but modulations of the same fabric of space/time, so information can flow within them or from one to the other; this flow of information is what we call energy, in general, and any particular example of this kind of flow that goes from one such system –subject or object– to another, is what we call signals. So all signals carry information and, potentially, meaning; but as we said earlier, there is no meaning without life.

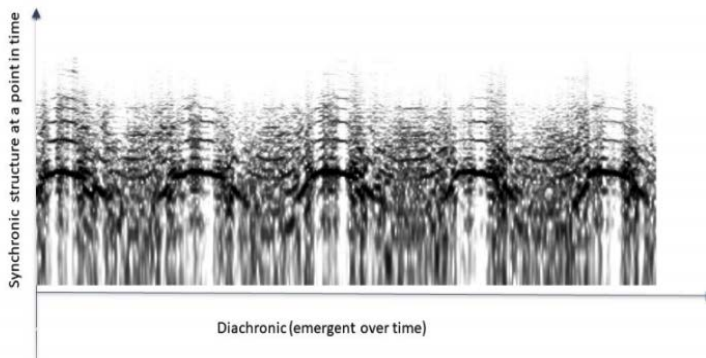
When signals carry information configured by a subject to evoke a predetermined effect on another subject, we call that ‘communication’. Nevertheless, there are signals that carry meaning for a subject but may or may not be part of communication. These signals are called ‘symptoms’ and they are configurations produced by given objects in a typical sequence with actual –meaningful– configurations, that is with configurations that typically interact with a given subject producing a consequence for that subject's survival, whether conducive or detrimental for that survival.

“Do cells sing to each other?”

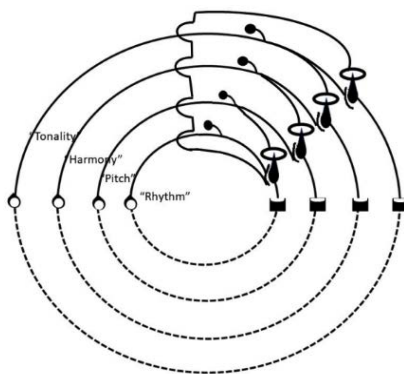
David Bohm considered that: “in listening to music, one is directly perceiving an implicate order” (Bohm 2002).

Whilst remaining controversial, the wide-ranging nature of Bohm’s theory of implicate and explicate order presents an imaginative opportunity to connect to other scholarly considerations of music and communication (notably by Langer (Langer 1990) and Schutz (Schütz 1951)) and consider that Bohm’s insight might extend to cellular communication as well as physics. This paper considers whether a process of “directly perceiving an implicate order” might be a mechanism in cellular communication, and how such a process might be articulated with reference to ways of describing musical communication.

Central to Bohm’s approach is the acknowledgement of multiplicity of description: what we think of as single descriptions like “a chair” or “a message” are, he contends, multiplicities. Fourier analysis of music reveals multiplicities which are both synchronic and diachronic, as shown in the spectral sound image below:



Each synchronic (vertical) level of the sound spectrum can be considered redundant: overtones add to the richness of the sound, but the essential function of a tone is preserved by the context. Diachronically, melody and harmony describe different aspects of the same thing, but both synchronic and diachronic aspects together form a coherence, which in Bohm’s physical theory, he saw as a symmetry. I suggest a logical characterisation of this drawing using McCulloch’s model of perception (McCulloch 1945). In McCulloch’s work, perception is a coherence between multiple excitations of ‘drome’ circuits which configure each other, producing a syndrome. McCulloch illustrates his idea with a diagram of the inter-connected circuits where each dromic excitation can either stimulate or attenuate every other level. I argue that this is comparable to the synchronic structure produced in music frequency analysis. In arguing this, I suggest that McCulloch’s dromic diagram can be drawn with different circuits representing basic categories of music (e.g. rhythm, melody, harmony, tonality)



Beyond basic categories like this, in music there are emergent categories as articulations of tonal and thematic structure unfold. In McCulloch's diagram, this emergence can be represented with new dromic cycles interfering with existing ones. To explore this logical idea, experiments can be constructed which examine music for the Shannon entropy of its different aspects. Each feature can be treated as an 'alphabet' with an emergent entropy, where each aspect's change in entropy affects every other aspect. The resonances from McCulloch's loops can be re-represented empirically by plotting the changes in entropy over time from one description/alphabet to another. In doing so, we can investigate at what point (and by what mechanism) new alphabets are introduced, and secondly, by what mechanism do existing recognised aspects disappear. Using evidence of such analysis on a variety of music, I suggest that new categories emerge when the relative entropy between descriptions is coordinated in some way such that the correlation acquires some new label. Is cellular communication like this? Is there a similar dance between multiple redundant descriptions? Musical coordination occurs in a context of awareness of multiple descriptions and self-awareness of participation in descriptions. Sometimes multiple descriptions of the environment present ambiguity and uncertainty. If awareness of self and ambiguity is a function of the symmetry between different descriptions of reality then cellular development might be directed in ways which address resonant symmetries within and between cells. A mechanism similar to this has been suggested by Torday (John S. Torday 2012). Emergent categories in the development of symmetries may then break apart those symmetries (creating a broken symmetry in a similar way to Deacon's autocell (Deacon 2012)), just as a musical development will arrive at a cadence for something new to take shape.

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“To what extent are humans like cells and vice-versa? Reconsidering biosemiotic theory in the context of education”

The principal transducer of the discourse on information – whether in biology, physics, technology or sociology – is an education system supported by technology. It is through the education system that professors devise theories, publish papers, organise conferences and recruit students, some of whom will reproduce this practice. Whilst current theories of biosemiotics point towards self-organisation and semiosis (Hoffmeyer 2009), and concepts like entropy, variety, homeostasis, teleodynamics and heterarchy arise like new chapters in a textbook, the education system which frames that discourse is dominated by hierarchy, status and the assumed (or declared) scarcity of knowledge (Illich 2001). Since information is a topic which dissolves disciplinary boundaries and challenges some of the organisational foundations of education, how could any biosemiotic theory be separated from a theory of the context from which it emerges: a theory of education, or (nowadays) a theory of technology? Does the development of better biosemiotic theory require a reorganisation of the institutional structures of education?

To address these questions, we report on a series of experiments in the UK and at the Far Eastern Federal University in Vladivostok, Russia. The aim of the experiments was to change the way conversations between students and staff were coordinated through a series of activities not based on hierarchically-established criteria or professional judgement but on self-organisation and self-evaluation, where eventual judgements about capability and intellectual growth were established following a process of continual peer-based comparison. In the experiments, groups of staff and students (between 10 to 20) were exposed to a series of artifacts designed to encourage them to think about personal or global issues. From the perspective of Peircean semiotics, each artifact might be considered to be a sign. However, we imagined that each object disrupts participants, and that the disruption process reveals something new about each participant to each other, which in turn drives communication. In the Russian experiment students and staff use a technology for “keeping track of and ranking important things” as their perception is disrupted by the uncertainties of the

environment. Data from the changing priorities of participants is compared with details about the different interventions made with the participants to draw conclusions about how intellectual positions and discourse develops against a changing context.

In asking “To what extent are humans like cells?”, we consider Torday’s theory of cellular communication which suggests that cells self-organise to manage the ambiguity of their environment (John S. Torday 2012). If this is the case, then communication becomes a transduction process where distinction boundaries (which Peircean theory sees to be signs) emerge through the over-riding system requirement to manage the ambiguity of the environment. Whilst this theory appears to fit the dynamics of these social experiments, we suggest that a cross-pollination between educational experiments and biological investigation is needed both to validate what are speculative theories, and to develop a richer educational context from which better theories might emerge.

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“Neural plasticity and trans-modal arbitrariness of signs”

This paper with an interdisciplinary approach attempts to reconcile with the concept of ‘arbitrariness’ in Semiotics and ‘neural plasticity’ in Life Science disciplines. Saussure proposed that the relationship between the signifier and the signified is an arbitrary phenomenon. When Saussure is juxtaposed with Peirce, one finds that arbitrariness is applicable only to the ‘symbolic’ category of signs to which language belongs. Still arbitrariness persists.

An enquiry into the arbitrariness in non-linguistic semeiosis liberates the researcher into interdisciplinary spaces. This paper attempts to superimpose arbitrariness into a non-linguistic, trans-modal semeiosis, which is otherwise defined as sensory substitution. The perception of space, movements and objects of the visually impaired, which are normally evoked through visual modality is mediated by tactile or auditory senses. For the purpose of this paper, the focus is narrowed down to only the substitution of visual signifiers (vidisigns) with tactile (tactisigns), opening a foothold to connect neural plasticity with semiotic arbitrariness. A question in the enquiry is: is the signified created by vidisign and tactisign the same; or are they different?

The recruitment of the visual cortex of the visually impaired to process other information in the brain is generally known as neural plasticity. It is the ability of the brain to create a signified of an object with tactisigns (narrowing the scope for this paper), which are normally created by vidisigns. Following the philosophical assumptions of the neurologist, VS Ramachandran¹, the study attempts to solve the nature of these signified in the visually impaired and otherwise. Previous studies are not conclusive on the question: if the visual cortex is converting the signifiers from other modes of perception into a visual signified which is later transferred to the temporal lobe for object recognition, or if the signifiers from other modes of perception are simply processed in the area since visual cortex is unutilized in the absence of visual stimuli.

The study is undertaken by using EEG experiments on visually impaired individuals in comparison with sighted persons. The EEG experiment reads the ERP of the visual cortex and temporal lobe of the experimental group who are introduced to an unfamiliar object in a span of one month and check for the activation of the visual cortex in the process of object recognition.

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“Psychedelic science, biosemiosis, and the afflictions of an ecology of mind: toward
a planetary sylvan ethics”

Drawing on ethnographic research in the Ecuadorian Amazon in and around rainforests and concerning the beings, human and nonhuman that live in them, I wish to discuss the traditional use of the psychedelic ayahuasca as a technique for the ethical orientation of thought in the context of the planetary ecological crisis. Ayahuasca, as a psychedelic, is literally “mind-manifesting.” Following Bateson I take mind to extend well beyond the human. Accordingly, ayahuasca has the potential to manifest not only the mind of the person who ingests it but also the greater “ecology of mind” of the forest. Humans are not the only ones who think. Forests and the many beings that live in them –animals, plants, and perhaps even spirits– also think. In the first part of the presentation, and drawing on the work of Peirce, Bateson and Deacon, I will rigorously document this seemingly metaphoric claim in bio-semiotic terms. My goal is not merely to label the forest as semiotic, but to use semiotics as a vehicle for learning to think with it on its own terms. The thoughts generated in a forest are, in a Peircian semiotic idiom, iconic and indexical. Following Deacon the forest is a vast teleodynamic system that is closely tied to its own morphodynamic, or form-generating, processes. In more colloquial terms all this is to say that sylvan thinking is highly imagistic. I turn to Peirce’s discussion of what he calls the “normative sciences” in the hopes of suggesting an ecological ethics that emerges from, is grounded in, and is oriented by the aesthetic (or imagistic) resonances that a forest generates. If the forest, in some real way or another, thinks, then the planetary ecological crisis can be thought of as a crisis in mental health –a crisis affecting the many ecologies of mind that have emerged on this planet. Recent advances in psychiatric research have focused on the anti-depressive potential of therapeutic psychedelic use. If we understand “mind” as something that, following Bateson, is immanent to these broader sets of relations among the selves that make up these larger ecologies, then how might psychedelic techniques provide a broader kind of therapy concerning this larger mind and our relationship to it? In this presentation I wish to discuss some of the appeal of a psychedelic science. Traditional psychedelic use is, in a Peircian sense, a kind of science insofar as it provides a specific technique for learning by experience. It reminds us that the object of inquiry in the biological sciences is the psyche, or “mind” writ large (for evolutionary dynamics are always mental dynamics). And finally, insofar as it is concerned with techniques for the mind’s (*psyche*) manifestation (*dēlos*), it is, in formal terms, anti-depressive, in that it privileges the possibility for activating relatively entropic –in Bateson’s terms, playful– states that can create the conditions for the manifestation of novel emergent properties, which for Peirce is what defines mind *qua* mind. In sum, I argue that the cultivation of an anti-depressive emergent mode of being grounded in the distinctive semiotic properties that forests make manifest can provide ethical guidance in these times of human-driven planetary ecological crisis, a crisis that can be characterized as an affliction of this larger ecology of mind.

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“The epistemological underside of the code metaphor in biosemiotics”

The key notion of interpretation in Peircean semiotics poses a cardinal problem for biosemiotics in accounting for sign processes in living systems at the lower level, down to the cell. According to Barbieri^{1, 2}, the problem may be solved by discarding the notion of interpretation as irrelevant for semiosis and building a semiotic model exempt from the necessity to appeal to the ‘subjective’ factor of interpreter. To this end, biosemiotics is redefined as Code biology, or the study of all codes of life, from the genetic code all the way up to the codes of language. On such an approach, all codes in general and organic codes in particular are small sets of arbitrary rules not dictated by the laws of physics and chemistry; these rules are selected from a potentially unlimited number in order to ensure a specific correspondence between two independent worlds.

While basing my approach on the thesis that "semiosis is a central concept for biology that requires a more exact definition"^{3(p171)}, I am going to argue that the direction taken by Barbieri is based on an epistemic fallacy rooted in the language myth and follows the objectivist path to reification of sign relationships, with the expected result of giving a vitalistic explanation. I will further show that such terms as *genetic code*, *organic code*, *code biology*, *codepoiesis* etc. are metaphors provoked by a misunderstanding of the nature and function of language (cf.⁴); this misunderstanding keeps us in the epistemological trap of language.

I will conclude by emphasizing that genetic code is not language, and just as understanding language and its function cannot fully explain the phenomenon of ‘humanness’, neither can our understanding of genetic control explain life.

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“Basic neural anticipation: The problem of afferent synthesis”

A particularly interesting, if challenging question for biosemiotic and qualitative accounts of biological information has been the problem of neural signal integration, including its possible anticipatory and autonomous aspects. Here, it is considered how new types of experiments on the mechanisms underlying action potential generation in single neurons (Sardi et al 2017) may be particularly relevant in this case, and complement earlier studies on the mechanisms of afferent integration and anticipation in single brain cells (Anokhin 1984). Although in different aspects, it is argued that both of these analyses reveal unexpected complexity and selectivity in the basic processes of signal “summation“ in single cells, and possibly, allow to consider these key neural processes from a biosemiotic perspective.

Thus, based on early evidence from electron microscopy, as well as their own pharmacological and physiological studies, P.K. Anokhin and colleagues (Anokhin 1984) suggested that the biophysical propagation and summation models of signal transmission (prevalent at the time, and in many aspects even now) may contain serious fallacies when applied from the effector side of a neuron (axon) to its receptor side (dendrites and soma), as doing so would obscure the whole problem of information specificity and transmission – how a particular set of afferent inputs can be mapped to correspondingly specific outputs in individual neurons and functional systems? Furthermore, compatible experimental evidence has recently emerged revealing new types of integrative and selective processes at the basis of spike generation in single cells (Sardi et al 2017). By showing evidence conflicting with the notion of isotropic summation, as well as demonstrating non-occurrence of simple summation and subtraction effects in combined intra- and extracellular stimulations (Sardi et al 2017), these novel findings may call for current biophysical models of spike generation to be significantly revised – with a view on possible multiple independent threshold elements within each cell that are anisotropically activated (Sardi 2017), and in line with functional systems theory, may express differential transmitter sensitivity, nuclear pathways and metabolism (Anokhin 1984). If supported by further evidence, these could be important steps towards revealing the semiotic complexity of afferent synthesis in single brain cells, and more generally, understanding the possibility of qualitative distinctions being made and retained at the level of elementary neural processing (Tse 2013).

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“The first qualisigns: Steps towards the biosemiotic solution of the hard problem”

“The hard problem” as it has been formulated in philosophy by David Chalmers is not solvable within philosophy – it belongs to the field of biosemiotics and also can be solved by biosemiotics.

Indeed, a semiotic approach makes biology (a) softer in the sense of introducing methods from soft sciences and (b) harder in the sense of introducing the problems related to the origin and development of mind.

The hard problem of consciousness is the problem of explaining how and why organisms have qualia or phenomenal experience. This is the key element of mind–body problem. In semiotics, we have tools for a more technical formulation of this problem. Quale, or a qualisign, is the simplest type of sign in the Peircean classification, and its appearance is accordingly related to the lower semiotic threshold zone.

Finding the necessary and sufficient conditions for a qualisign is a very relevant problem for biosemiotics, and several steps towards its solution have already been made. Jesper Hoffmeyer and Terrence Deacon have dealt much with this in their work; additional aspects have been recently studied by Mihai Nadin and Per Aage Brandt in their approaches to the new understanding of signs as such.

In (bio)semiotics, this problem can be reformulated in the following way: “Describe the minimum mechanism of meaning-making, while defining meaning in a way that assumes its non-algorithmicity”. Non-algorithmicity brings irreducibility and radical novelty into the phenomenon, as well as makes the problem hard.

The whole difficult problem, however, can be divided into a series of sub-problems, or steps addressing the five major aspects required for the modelling of semiosis or interpretation processes. These five major aspects are as follows.

1. Mediatedness. Sign relations always assume a mediator that builds the relation and has the ability to connect objects arbitrarily. This feature was described already in the workings of the nerves by Johannes Müller in the 19th century (and as endorsed by Jakob von Uexküll in the 20th). Using a different terminology, Marcello Barbieri stresses the same need for a mediator (or “adaptor”) role in his analysis of genetic and transduction codes. Such a role is certainly necessary, but insufficient for semiosis and phenomenal experience.
2. Code plurality. Meaning-making requires at least two codes to be generative. This condition has been described as code duality by Jesper Hoffmeyer, Claus Emmeche, and Juri Lotman.
3. Choice. New sign relations, emerging as new connections, assume the choice between possibilities; this distinguishes interpretation as an anticipatory process from other forms of causality. It occurs in case of coexistence or clash between codes. In this context, the concept of possibilities has been emphasized by Stuart Kauffman and Donald Favareau, and the concepts of absence and intentionality by Terrence Deacon.
4. Incompatibility. Possibilities can only exist as separate possibilities if these are incompatible, in the sense that one cannot be reduced to one other or that they cannot be executed simultaneously. This is the nature of “quality” or of the qualitative (difference) as a general feature of every sign.
5. The subjective present. Choice between possibilities as options assumes the simultaneity of possibilities; this implies the existence of a subjective present. This semio-temporal feature is necessary for sign action, while being presumably non- algorithmic.

This list of obligatory features of qualisigns is as yet unfinished, and each of the steps above still requires much closer analysis. The question remains, too, whether or not all of these conditions can be fulfilled for a cell. In this presentation, I will focus on time windows as a characteristic of the subjective present and the relatedness of this phenomenon to the various types of signs.

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“Triadic conception of relations: Peircean proteomics”

It is a well-known fact that Peirce’s philosophy and logic were inspired by his early studies of chemistry. It was the topological and relational understanding of chemical compounds that Peirce applied later on his studies in logic. In those years, chemistry was only obtaining its solid foundations and status of a hard science. The originality of Peirce’s approach resided in that he observed the molecular relations rather than concrete chemical qualities, he was interested in molecular topology and its spatial representations.

In present days, the protein studies are in the same situation as chemistry in the second half of the 19th century, proteomics is only trying to find its solid foundations. Protein folding, a process of getting the final protein structure of the original peptide chain, is very obscure process so far, rules governing the protein folding waiting to be discovered. Knowing perfectly chemical and physical properties of the peptide chain that is potential to fold, does not help that much in understanding the question *Why proteins fold in that way and not another?* Chemistry and physics playing a role, yet seem not to be the crucial answer, an explanation of another essence is being enquired for: “a protein code” or “protein grammar” or “protein syntax” are terms that occur, a mechanism rather conventional, as a code is being enquired for rather than purely chemical explanations.

In our talk, inspired by the quest for protein folding, we propose to go back to Peirce’s lesson in “chemistry of relations” and to observe proteins with this optic. Chemistry provided a kind of material support for Peirce’s abstract logical reasoning. Now it is possible to proceed vice versa and use Peirce’s abstract logical reasoning to approach proteins, biological material construing all forms of life. In our talk, we will propose to apply the notion of Peirce’s Non-Reduction Theorem/Reduction Thesis to the protein folding process. We will apply Peircian triadic conception of relation to biology, in particular, to proteomics. It will be argued that explanations in biology might be irreducible to dyadic conception of logical relation. In fact, as will be demonstrated, the distinguishing between dyadic and triadic leads to the known problem of distinction between semiotical and physical.

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“‘The Tao in one’s own nature’: The congruence of Asian wisdom traditions and cognitive neuroscience in identifying the source and implications of human uniqueness”

A key issue in the investigation of nonhuman communication through biosemiotics is understanding the implications of uniquely human aspects of consciousness. To what extent does the human propensity for conceptualization (which I refer to elsewhere as the “patterning instinct”) block our ability to experience a deep, intimate connection with other sentience—and can this blockage be overcome?

This paper explores how insights from East Asian wisdom traditions overlap with cognitive neuroscience to help answer these questions. I suggest that interpreting these traditions through the lens of cognitive neuroscience can guide us toward a deeper, embodied understanding of human/nonhuman semiotics.

Diverse traditions of Asia have in common the recognition of a cognitive function unique to humans that blocks the most intimate and unalloyed connection with other aspects of the natural world. The *Tao Te Ching* refers to the “nameless uncarved wood” as an exemplar of the unmediated experience of Tao. Zen Buddhism disrupts the conventional distinctions made between humans and animals by inviting meditators to ponder: “Does a dog have Buddha-nature?”

In the Taoist tradition, the human capacity for conceptualization is viewed as the foundation for all aspects of human civilization including language, as well as the source of separation from a deep human connection with nature. Uniquely human activity is seen as purposive and effortful (*yu-wei*) as opposed to nonhuman activity which is naturally effortless (*wu-wei*). Zen, emerging from the intersection of Taoist and Buddhist traditions, recognizes discriminative thought as a block to an enlightened understanding of one’s own true nature as non-self.

The Neo-Confucian school of the Song Dynasty, combining Taoism and Buddhism with Confucianism, attempted to traverse the barriers of human uniqueness by investigating the organizing principles of the universe (*li*) as coherent gestalts embedded fractally within larger gestalts. “If one wishes to know the reality of Tao,” wrote philosopher Zhu Xi, “one must seek it in one’s own nature,” recognizing (a millennium before European phenomenology) that our knowledge of the world is necessarily subjective. Neo-Confucian philosophers emphasized the importance of knowing something, not just through the intellect, but throughout the entire mind-body organism, and—in direct contrast to the paradigmatic Western split between mind and body—saw a primary function of the heart-mind (*xin*) as integrating intellect with embodied experience.

Findings in cognitive neuroscience offer a powerful validation to these ancient insights. The highly developed human prefrontal cortex (“PFC”) has been shown to be responsible for cognitive control by mediating impulse repression, planning, and goal orientation. Its left hemisphere in particular, creating an ongoing logical narrative of self, is likely a foundational requirement for language and a fixed sense of separate identity. The PFC’s capability for mediating conceptual thought is associated with what Daniel Kahneman refers to as System 2: the “conscious, reasoning self” that is contrasted with the automatic, effortless processes of System 1.

At the same time, insights of leading cognitive neuroscientists (Damasio, LeDoux, Pessoa) corroborate the Neo-Confucian model of cognition, identifying the PFC as primarily having an integrative function in consciousness. These findings, when applied to traditional wisdom practices and techniques, suggest potential pathways to achieving the Neo-Confucian goal of understanding—in both an embodied and intellectual way—the deepest patterns of self-organization that human consciousness shares with nonhuman nature.

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“A visual neurobiology approach to the semiotics of art and design”

Our visual experience of art and design –like, for example, appreciating art in a gallery, moving around in an architectural space, watching a movie or some advertisement, etc.– is well documented in different institutions around the globe since the onset of modern neuroscience, neuromarketing, and the emergence of biophilic design. Recently we are finding out that this visual experience is something that we decode via emotive reactions and depends ultimately on our brains; actually, most of the visual semiosis (meaning-making) process comes from our emotive reactions mechanism and by understanding what goes on in our brains when we look at a work of art or design we will increase our appreciation', understanding and control of their meaning.

We inherited the emotive reaction mechanism from our ancestors, as a part of an evolutionary process that helped them to survive by making the right choices under specific circumstances. It is always been all about prediction; like when hunting, foraging, mating or avoiding dangerous predators, it all came down to emotionally reacting to the perceptual configurations they faced. So now we use the same emotive reaction mechanism, when facing artificial configurations (art or design) to produce an emotive response typical for all human beings, according to TER (Theory of emotive reactions) proposed by Dr. Jaime Cuanalo on his new book about the semiology for artist and designers.² As we shall see, there's a strong typicality in the correlation between the visual configuration on the composition (how formal data is arranged, like hue, tone, saturation, background and figures) from the visual works of art or design and the visual-to-emotive neural processing that happens when we face it. The analysis presented here is based on the hypothesis that when we experience or observe works of art and design, two simultaneous readings occur; these is the emotive reading and the conventional reading. Thus, we form a third reading - that is the associative reading - and by these we can decode the total meaning of the visual work, something that will not only help us understand its meaning, as part of the audience, but will help artists and designers to optimize their work.

This paper seeks to answer how to decode the meaning in art and design by helping us to understand the formal parameters and relations generally involved in every visual composition, and explain it based on the semiotic analysis proposed here. This semiotic analysis is a synthesis from different results in visual neurobiology and the development of experimental psychology by the American Psychological Association (AAP), along with the Institute of Color –among other scientific associations–; thanks to those scientific discoveries, we have been provided with more sophisticated tools that help us understand how we react to typical configurations and therefore know with more precision the meaning of a work of art or design. Said methodology, currently being used intensively at ESAV and applied in the doctoral study of this author, seeks to facilitate the understanding of the meaning of the visual works of art and design in a systematic and objective way.

Keywords: semiology, biosemiotics, neurobiology, art, design

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“Incomplete culture: Translation as biosemiotic work”

In his *Incomplete Nature*, Deacon (2013; 2016) aims to provide an account of ‘mind’ that is fully in line with, or does not contradict or does not assume anything added to the laws of physics that govern the universe. This effort from the side of the natural sciences towards explaining mind requires, in my view, a response from humanities scholars who usually assume mind or cultural phenomena. Deacon proposes a unifying theory of everything by regarding information as work. In particular, he posits the notion of constraints as central to understanding the emergence of new forms through constraining work on information.

In this presentation, I take up Deacon’s suggestions regarding constraints and, linking those to Peircean semiotics, work out some of the implications for a theory of translation – or semiotic process. Taking Peirce’s definition of meaning as the translation of a sign into another sign, I argue that translation entails semiotic work, in particular semiotic work that constrains semiotic possibilities – as suggested by Queiroz and Loula (2011). In terms of this conceptualization, translation entails applying constraints to possible meanings, from DNA through phyto and zoosemiotics to anthroposemiotics. In this sense, culture is as incomplete as nature, to refer to Deacon, and has to be completed, amended or created through biosemiotic work, never without it. The imposition of constraints might well offer new analytic tools to describe the emergence of cultural and/or social phenomena.

To illustrate the analytic ability of this kind of thinking, I provide examples of translations in a variety of semiotic spheres (phyto, zoo, anthro) to compare and illustrate the way in which constraints operate on these.

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“Health, biofields and semiotic corruption”

In his paper on *The Semiotics of Global Warming: Combating Semiotic Corruption*, Australian process philosopher, Arran Gare, argues that anthropomorphic climate change has emerged as a consequence of semiotic corruption. This occurs when the signs produced and received by living organisms necessary for the health and perdurance of living processes are corrupted and distorted in some way. In human unworlds, this can occur when we commit what Alfred North Whitehead called, the fallacy of misplaced concreteness; mistaking our abstract concepts of reality for reality itself. In this presentation I will use the example of a major global health problem, type 2 diabetes, to illustrate how semiotic corruption works to distort people’s understanding of what the conditions for healthy life are. For example, examining the role of the food processing industry in creating and marketing their own reality of how food should look and be eaten.

In a more recent paper from Gare on *Chreods, Homeorhesis and Biofields: Finding the Right Path for Science through Daoism*, he argues for the importance of understanding reality in terms of relatively vague dynamic fields based on the work of biologist Conrad H. Waddington. The shift in physics from substance metaphysics to field theories has in turn shifted physics towards process metaphysics. Our understanding of the Higgs field, for example, reveals that it acts to create order in the universe by regulating the velocities of vibratory processes. In biofields there is further complexity in that living processes generate meaning through semiotic processes. In this presentation, therefore, I will speculate about the relationships between biofields and semiosis focusing on the problem of semiotic corruption. For example, in the field theory of French philosopher and sociologist, Pierre Bourdieu, the health of fields is largely determined by their levels of autonomy. In Bourdieu’s work, the dominance of the economic field in modern society undermines the autonomy of all other fields. I will argue that this is a case of semiotic corruption related to changes in the regulation of velocities of processes within and between fields.

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“How ought emerged from is the co-origination of normativity and life”

In ‘*Theses on Biosemiotics: Prolegomena to a Theoretical Biology*’, Kull et al.¹ describe certain desiderata for a full-fledged semiotic biology. These include the need for a naturalistic account of normativity in relation to an organisms’ autonomy and the semiotic processes which it takes part in.

The relation between autonomy and normativity has attracted the attention of a number of authors. Within the context of this discussion, autonomy is broadly defined as the capacity to act on one’s own behalf so as to continuously produce and maintain one’s self in far-from-equilibrium conditions. The precarity inherent to this kind of existence has distinct success conditions which makes it intrinsically normative.

Though I believe that these approaches are on the right track, I argue that they have mostly fallen short in two respects. Firstly, these theories usually lack of a scientifically complete explanation regarding the nature of such autonomous systems. A bacterium swimming up a sugar gradient is often invoked as a prototypical example of adaptive, autonomous behaviour. But authors often fail to recognise that this behaviour is due to complex evolved mechanisms which obscure a more fundamental organisational logic prior to the evolution of bacteria. As a result, the locus of autonomy is attributed to the capacity to act on an environmental niche in complex ways², while ignoring that this presupposes the prior emergence of a dynamically individuated system which constitutes a basic self-other relationship. As such, many theories describe what must be true of living systems without explanation.

The second, more elusive problem lies in the nature of normativity itself. In the spirit of Hume’s is-ought problem, we must recognise that normativity is not extended in space and time and thus seemingly cannot be derived from fact. And yet, normativity must have come into the world with the first autonomous system.

To overcome both of these problem without falling prey to metaphysical dualism will require a conception of strong emergence that explains both how novel dynamical structures and nonphysical features like normativity to come into the world. The difficult task is to show how the latter is dependent on but not reducible to the former, and doing so without rendering normativity epiphenomenal in the process. Building on work by Deacon³, I argue that his autogenic model 3 provides us the tools to understand how constraints and causality—which are always extrinsic to chemical and physical features—can become internal to a system. This suggests that what constitutes organismic internality is not physics or chemistry, but a recursive dynamical logic which constitutes a new frame of reference relative to which normativity can be understood. It is only upon this theoretical ground that we can then describe the evolution of novel dynamics with functional, normative features which make complex adaptive behaviour possible.

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“The semiotics of acupoint biophoton emissions testing: Signs of luminescence, signs of pathology, signs of logic”

Acupoint Biophoton Emissions Testing (ABET) was originally developed over the course of more than thirty years of clinical practice in the medical offices of the late Dr. Matt VanBenschoten (1957-2015), an internationally recognized specialist in Traditional Chinese Medicine (TCM) based in Canoga Park, California.¹ Dr. VanBenschoten sought to increase the effectiveness of Chinese herbal treatments in patients suffering from a variety of conditions that standard medical treatment as well as acupuncture had failed to address with complete or, in some cases, even partial success. While ABET draws its diagnostic perspective from TCM, it also has developed from research in biophysics and electrophysiology that has investigated photon storage, transmission, and (ultraweak) emission in intra and intercellular biological systems, sometimes characterizing these processes in terms of “information” or “communication.”² The ABET method, characterized here as a biosemiotic system, is performed manually employing an array of gestural movement processes that are of two distinct kinds. One kind consists of what are sometimes referred to by practitioners as hand “signals,” which replicate varying forms of bio-luminescence associated with different pathogens. The second type consists of gestural actions that are performed interactively, using thumb and index fingers in contact with one another at their distal ends or tips. Both of these types of gestural action qualify as Symbols of the “Term” variety in Peircean semeiotic theory. However, they are mediational rather than representational in character, creating triadic valences through the co-ordinated performance of relationship-generating (re-)movements rather than “standing for” or “carrying” information originally contained in some relatively removed Object. As used in the ABET diagnostic method, the two types of gestural Terms serve to) bring the practitioner into a dynamic relationship with a patient’s acupuncture points and meridians, and) enable deductive investigations of the patient’s internal condition via an applied kinesiology technique developed by Y. Omura known as “O-Ring” testing.³ Performed in alternating sequences, the two types of ABET gestural Terms are phrased into relational complexes that signify the probable identity, location, and quantity of pathogens in the patient’s body as well as the optimal composition of an herbal mixture capable of neutralizing the patient’s pathogenic condition. In this manner, the ABET diagnostic method employs an array of Symbolic Term and Term-relational movements, the purpose of which are to both deduce and co-perform Iconic synchronizations of biophotonic resonances. When such co-resonance is confirmed by O-ring testing, the probable presence of a given pathogen is established or proven. The ABET diagnostic method demonstrates a multi-faceted bio-semiosis that entails an unusual combination of semiotic processes. Once co-embodied simultaneously by practitioner and patient, biophoton emissions create the (Hypo-ionic) communicative basis from which a patient’s endosemiotic condition can be logically interpreted by the practitioner via (Symbolic) sign performances that are entirely corporeal in character while nonetheless belonging unambiguously to the “Proposition” and “Argument” classes of Peirce’s ten-fold sign categorization. While Argument signs are typically associated only with socio/linguistic sign processes, the ABET diagnostic method can be performed without involving any linguistic forms of sign processing. The biosemiotics of the ABET diagnostic method thus illustrate an iconic intercellular luminescent interface serving as a Peircean ground relating endo- and exo-semiotic processes (or, perhaps, “co-endosemiotic” processes) via non-linguistic yet logical gestural movement patterning.

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“The bioinformatics and biosemiotics of protein sorting”

Proteins exist and carry out their functions in various compartments of the cell – some even belong *outside* the cell. It is of vital importance to the cell and the organism that the right proteins are transported to their proper compartments after (or during) their synthesis. But what determines this sorting?

In 1999, the Nobel Prize in Physiology or Medicine was awarded to Günter Blobel for the discovery that “proteins have intrinsic signals that govern their transport and localization in the cell.”¹ By this very wording, the Nobel Assembly implicitly acknowledged that a semiotic entity – a signal – can have causal powers in a biological cell. But is this label of “signal” merely a convenient shorthand for complex physico-chemical causal interactions, or is there actual semiosis happening in the recognition of protein sorting signals?

This recognition obviously works in the cell, but it is not easily emulated in the computer. Even the best known sorting signal, the *signal peptide*, which directs its protein to the secretory pathway, is highly variable, making the distinction between signal peptides and other sequences non-trivial. In fact, I have spent most of my career as a bioinformatician trying to recognize signal peptides and other protein sorting signals in amino acid sequences by various machine learning methods. This has resulted in, e.g., the SignalP program for prediction of signal peptides,² which has gathered thousands of citations.

Recently, my group published the DeepLoc program for multi-class prediction of protein subcellular localization based on deep recurrent neural networks.³ In addition to the class prediction, DeepLoc outputs an attention function, showing which parts of the sequence were important for the prediction. I will show how DeepLoc, given only amino acid sequences and class labels during training, is on its own able to locate relevant sorting signals in the sequences.

However, the sorting signals are not like words in a human language, and they are not arbitrary with respect to the physico-chemical properties of the constituent amino acids. I will discuss whether the relationship between a protein sorting signal – viewed as an Aristotelian formal cause – and protein function in the proper compartment – viewed as the corresponding final cause – is indeed semiotic in the context of the living organism.

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“Retro-causal scaffolding of e-series time: How does time flow in living systems?”

A semiotic account on how time can come to flow in biological worlds is developed. We already presented the definition of time series on the interpretive/semiotic base for explaining biological time in terms of the E-series, that is to say, local synchronization, which is distinctly different from our ordinary clock time³. Communicative punctuation plays the key role there, in which living time is interactively created through semiotic scaffolding¹. The cornerstones for the present paper are: retro-causality, E-series time, interpretive negotiation, and anticipatory action.

We know the self-running time represented by a clock as being different from time used to adjust each other's steps for dancing, for example. These two simply belong to different temporal domains: the former belongs to globally synchronized B-series time in physics, and the latter to locally synchronized E-series time experienced in biological worlds. Circadian, circalunadian, circannual cycles in organisms available to biological worlds are partly endogenous but partly the results of their co-adjusting to the changes of environmental conditions.

Despite the difference in characteristics, both B-series time and E-series time consider the present moment as the crux of their time code. Each time series has its own interpretive scheme of how to grasp the present moment of now. B-series time globally defines the present moment and sets the sequence of earlier/later accordingly. The B-series, clocks and metronomes, has no flow of time, as physicists reluctantly admit. The flow of time entertained in physics is no more than a matter of interpretation by the physicists. It is just unlikely that living organisms use tense-less B-series time.

In contrast, E-series time encountered in living systems is unique in fabricating the present moment of now from within. At this point enters retro-causality or backward causation². Instead of relying upon the globally determined present moment, each organism mutually implements the present moment of a local nature through the reciprocal negotiation in both forward and backward directions. E-series time is a continuous process of trial-and-error in which the retrospective error imputed to the preceding punctuation calls for a new punctuation for making a renewed trial for correcting the preceding error. That is the activity of approximating whereabouts of the present moment in a mutually coordinated manner in local time. That activity upholds the flow of time of a local nature. The updating is done by correcting its own punctuation as responding to the punctuations of the others nearby or the environment. As long as the correcting and updating continue, E-series time flows and remains intact.

E-series time is retro-causal in the sense that an organism is constantly self-correcting the preceding setting of its own. The moment of now in action in the E-series is continually transferred into the B-series in retrospect, since the recording of that transference, once completed, starts freezing the earlier/later relations permanently. An essence of retro-causality may be seen in acting for the present in the immediate future, while causality conceived within physical sciences interprets the present to be the factor for driving itself towards the future. As much as the deed of recording makes the flow of time for the B-series, the act of punctuation makes the flow of time for the E-series. Instead of freely riding on the predetermined flow of time to which physics has been accustomed, the semiotic scaffolding proceeds as precipitating the flow of time from within.

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“Semiosis in the heart of nature – the eidetic biology of Zdeněk Neubauer”

The Czech biologist and philosopher Zdeněk Neubauer (1942-2016) is the author of a unique concept called Eidetic Biology. Nowadays, this approach is being developed by researchers at the Faculty of Sciences at the Charles University in Prague, as well as by several other teams in Central Europe. We perceive it as a valuable contribution to the development of biology and theory of communication, and a major source of inspiration for the Prague School of Biosemiotics.

Eidetic biology cannot be understood as a mere supplement of mainstream biology. It requires a significant change in scientific attitude to living beings.

Professor Neubauer argues against the “objective biology” based on the postulates developed by European science during the period of modernism, where living beings are reduced to “objects” governed by “law of nature” understood in terms of physical and chemical interactions and linear causality. These objects exist in a homogenous space and time.

As an option, Neubauer develops the “eidetic biology” with three basic concepts: form/shape (eidos), semiotic (eidetic) space and semiotic time.

Form/shape: in contrast to the world of “objectivity” Neubauer unfolds the world of “eidos” where every living being struggles to express itself (it-self), developing a unique and dynamic form that is never random, but is always an expression of the inner life and history of the relevant individual, as well as its interpretation of events and the environment.

Semiotic space: in contrast to the 3-dimensional space of geometry, so popular in modern science, Neubauer works on the concept of a semiotic “eidetic space” – dynamic space of interpretation and meaning-making. This space is collectively shaped by all living beings in the relevant area. **Semiotic time:** the time in eidetic biology is not homogenous and cannot be measured by any measuring device. It is understood as one of the building materials the living beings use to express themselves. The form of the living being is perceived as a specific “shape of time”.

Eidetic biology offers a journey from a world where interpretation is mostly a human activity, arbitrary and marginal back to a world where semiosis lies in the very heart of nature.

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“Semiosis and the sugar civilization”

In the first moments of the *Course in general linguistics*, Ferdinand de Saussure opens up the field of what will become semiology, famously proposing to investigate “the life of signs within social life.” Attributing life to “semiological systems,” the Swiss linguist recognizes that they function partly outside human intentionality: “the distinguishing characteristic of the sign [...] is that in some way it always eludes the individual or social will” (1916, 17). Imbued with life and autonomy, the Saussurean sign seems strangely akin to Peirce’s semiosis, defined as “an action, or influence, which is, or involves, a cooperation of three subjects, such as a sign, its object, and its interpretant” (CP 5.484), the latter being, according to our philosopher’s “provisional assumption”, “a sufficiently close analogue of a modification of consciousness” (CP 5.485). We can thus consider that the life of signs, or semiosis, is constituted of a cascade of actions or influences, partly eluding individual or social will, and resulting in modifications of consciousness.

Such life unfolds within the biosphere; human semiosis is shaped by numerous biological factors, such as our symbiotic relationship with plants. Let us consider the Age of Enlightenment, when began a speeding up of global sign exchange. The Enlightenment coincides with the Industrial Revolution and the birth of modern capitalism, which are enmeshed with the colonization of Africa and the Americas by Western countries, and the new availability of sugar, coffee and tobacco on their markets. Often achieved through slavery, the mass production of these goods imposed elongated, often lethal, working hours. Back in Europe, the new availability of cheap, high-caloric sweetened goods allowed factory workers to follow the developing machine rhythms. It appears that these accelerated, intensified cadences also concern the production of human signs.

Is it possible to link the acceleration of “the life of signs” that accompanied industrialization with the introduction of sugar in Western diet? In humans, the brain accounts for approximately 2% of the body weight, but it consumes around 20% of glucose-derived energy (Erbsloh F. *et al.* 1958), making it the main consumer of glucose. Did the sugar cane respond to the neurophysiological demands of semiotic growth that paralleled economic growth and colonial expansion? Shouldn’t we consider plants that associate with humans to expand their niche as shapers of semiosis, shapers that bring “modifications of consciousness” and “elude individual or social will”?

In this presentation, I would like to speculate on the interrelations between the life of signs and the life of plants, in the context of the colonial, industrial and neurophysiological history of sugar.

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“Eidetic biology of Zdenek Neubauer”

This thesis introduces the philosophical and biological work of Professor Zdeněk Neubauer (1942-2016) of Charles University in Prague. His original interpretations in science history and epistemology still have much to offer. He was deeply inspired by the work of Adolf Portman, Rupert Sheldrake and Gregory Bateson, who helped to rekindle interest about appearances and the morphological side of reality. Sadly, his work did not receive much publicity in non-Czech circles due to communist persecution. Prof. Neubauer graduated in microbiology, biology and chemistry and he made several discoveries in genetics. He started his career as a virologist, focusing on the “reproduction” of bacteriophages. Soon after, he grew disappointed with the reductionism of modern biology and decided to complement his work by studying philosophy and the history of science. He realized that the formation of modern objectivist science was not, within the historical context, a given, a natural outcome, and he tried to better understand the philosophical sources of its origins. He created a multidisciplinary centre at the Charles University in Prague, uniting the approaches used by natural sciences and humanities: the Department of Philosophy and History of Natural Sciences. It was here where he later inspired the development of the biosemiotic branch of the department. The department is still active and has managed to maintain the original atmosphere of free and open research.

Prof. Neubauer then developed the so-called “Eidetic” Biology (inspired by the Greek word "eidos", which means “a form”). According to this theory, “eidos” can be described as an “archetype” with a dynamic nature, i.e. it represents a “field of possibilities” a particular living being can reach. Any species or an individual life form is “merely” one realization of the available possibilities. Prof. Neubauer argues that biology's role is not to describe an ideal “mean” for a group of organisms but rather to “celebrate” the prospect of possibilities the organisms can reach (in terms of morphological transformations etc.). He further theorises that the highest degree of variability in terms of traits can be found mainly with regards to the appearance of organisms. However, these traits are very often virtually useless and independent of the natural (or sexual) selection; moreover, they tend to be costly. They are the expression of the “individual singularity” of species. (In German “Selbstdarstellung der Innerlichkeit”, expression of inwardness.) These traits are not created casually but have an intrinsic “order of transformations”. According to Neubauer, the order of forms could be described as a “cultural logic of creativity”. Therefore, the aim (and possibly the challenge) of life and evolution is not “surviving and reproducing”, but rather the singular expression of the possibilities of form (“eidos”). Life can thus be understood as a large semiotic interpretation in which individual organisms present challenges to each other not in the Darwinian sense but in terms of the “strongest interpretation”, the most impressive exegesis.

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“Can truth and love prevail? A biosemiotic solution to the problem of meaning”

The grand aspiration of the Hussite motto: Truth Prevails has long been revealed a chimera: at least it is clear that the Hussite truth-claims certainly did not prevail. The question posed here is whether Vaclav Havel’s reconceiving thereof: Truth and Love Prevails does anything to solve the many problems posed by ‘truth’ – or love. Neither ‘soft’ romantic subjectivity nor ‘hard’ materialistic objectivity nor any absurd combination of the two can make sense of the assertion; but semiotics can.

There yet remains a general presumption that all three of these concepts – truth, love, and prevail, depend on philosophical idealism: the notion that ideals exist as eternal archetypes that strut and fret their way across human history with frightening regularity – more, that the perceiving of these notions is evidence for arguments from Idealism. But the sentiment of an Idealist is never accepted as sentiment; to the contrary, it is commonly (and sentimentally) held as evidence in favor of an idealized truth-claim. Thus the (lower case) idealist loses the ability to distinguish proposition from being – or consequence. And thus whatever happens to be perceived as having prevailed in any given circumstance is held as somehow necessarily ordained. As these notions have proven untenable in the ongoing human negotiations of truth-claims that is the making of meaning, human culture has moved into an era commonly (and absurdly) labeled ‘post-truth’.

Biosemiotic theory offers a modeling of truth claiming that is uniquely suited to resolving this ongoing epistemic crisis. By turning our attention from the signified to the sign while indexing our icons symbolically, a person reproduces the process of meaning making, moment by moment. This is to say that meaning making happens among humans when we point to referents both physical and conceptual through the medium of a post-biotic living system, i.e., a symbolic ecosystem (culture or society). As a matter of course, when we have reproduction we have both variation and selection. As consequence of this process human minding opens novel psychical and physical niches: by attending the consequence, we deliberate our future.

Are biotic relationships more entangled, more stable because we have lived? When you grow food, do you work the soil such that it is ever more healthy because you have taken your food from it. This requires not only that we care, but also that we care about minding actual circumstances; which takes us back to Havel’s claim.

By applying biosemiotic theory to pragmatic semiotic notions of truth and love (James: The Meaning of Truth and Peirce: Vitally Important Topics and Evolutionary Love), and by further debunking Neo-Darwinian biology (Gould: The Spandrels of San Marcos and Flegr: Frozen Evolution) while attending the social consequences thereof (Tilly: Social Movements and Mead: The Philosophy of the Present), this essay uses Havel’s truth claim to posit a reconstruction of cultural epistemology, one that grows ever more urgent in light of the ongoing socio-epistemic and environmental crisis that is the Anthropocene.

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“Understanding the role of function in protein evolution using a novel Semiotic model”

Most models of protein evolution focus on what genetic changes occur without considering the underlying processes governing these changes. Protein evolution is a specific example of how a single component of a system changes over time. This broader question of what processes govern evolutionary change can be addressed using a system-wide Semiotic model rather than modeling proteins in isolation. The model introduced here aims to provide a simple case where function has a precise meaning by simulating how a single component within a larger system can dynamically change function over time. This class of Semiotic models reveal how large changes in the coding region of genomes relate to the change in function and thus acts as a starting point to include function within protein evolution models. A mechanistic explanation must incorporate what is driving evolutionary change. In the case of protein evolution, this is function: what a protein (component) does within a cell (system). More specifically, a protein's function, in a specific cellular environment, can be considered as the subset of properties required for the cell to survive. These concepts are loosely defined; therefore, this proposal aims to capture these aspects in a model and simultaneously provide a simple case where these terms have a precise meaning.

Presently, protein evolution is modelled as a Markov process; the current state of the system is the only factor determining the next state, and this assumption makes sense in the context of biological evolution. However, these models remove the context of a protein and its role in the cell by reducing it to only a sequence of amino acids, thus the state no longer considers function. These simplifications are a necessary part of modeling but impose constraints on inferences into the processes that drive evolutionary change. Although these models remain valuable, the inclusion of function is necessary for exploring the mechanism of protein evolution.

Semiotic models reflect an innovative class of models permitting investigation into the dynamic nature of function. This framework is crucial for evolving theories of the mechanisms underlying protein evolution. In contrast to current models of evolution, the novel Semiotic model proposed here incorporates function within its state. To do so, the state is extended to represent an entire individual organism, albeit abstractly, rather than a single protein or gene. During transcription and translation, DNA acts as a symbol and is interpreted to produce many biological macromolecule components. These processes are a consequence of interaction between various components within a cellular environment. These components are the products of transcription and translation itself, thus, the cellular system is self-referential: the current cellular environment is itself the product of an interpretation of the genome by a past cellular environment. Function is included in Semiotic models by leveraging this self-referential aspect of cells; the state of the model now includes an Interpreter as well as a Genome. The Interpreter represents the cellular environment and can read the Genome to produce a new Interpreter. Reproduction of an individual occurs in two steps: (i) mutating the genome, then (ii) creating a new Interpreter from the mutated genome using the parent Interpreter. The likelihood of survival for the resulting individual is determined by a fitness function operating on the entire individual.

This Semiotic model thus allows the changes in sequence, structure, and function of an evolving component to be observed simultaneously. This enables a range of new, previously unanswerable, questions to be addressed. For example, one can look at how a component gains a new function after a duplication event, or explore convergence at the functional level, rather than sequence alone.

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“Construction of memory in the biosemiotic system”

This proposal is being developed as an ongoing PhD research, which verses over the mechanism of memory in the semiotic system, its function, activation and the way information is provided to the memory system using the concepts of “appropriation” and “belonging”, accepting what Paul Ricour asserts, “making memory is part of a network of practical exploration of the world, of bodily and mental initiative that make us active subjects” [1]. Through natural activity what will be remembered, is that which has a meaning for the semiotic individual; allowing the appreciation of how memory is built in the biosemiotic system, based on texts and signs that are being interpreted. The interpretation is dependent on the provided codes that allowed translation and communication based on several tools necessary for interpretation. It is through biosemiotics that this can be explained, if based on the cell, memory can be selective and individual; this can be the key to unlocking the mechanism of memory in the semiotic system, due to the consideration that memory is active and important in the function of culture and the human sign, it also allows the system to update information for a social group in a specific moment. In the base of the process there is a creolized sign containing enough codes of sufficiently different individuals, through various times, capable of producing rich, varied texts that can merge with each other to provide codes of information for the interpreters, which need to reassign meaning to the phenomena of their environment, becoming capable of adapting it to their context. It is capable of referring us to a certain aroma, a tone of light in the afternoon that can evoke certain thoughts and what it conjures up has meaning only for the individual that correlates it to a vivid memory.

The concept of nature is implicit throughout this process, it is never far from the systemic conception of Semiosphere, given that the species also contain data and information; which speaks to the subject of something specific and general at the same time, something common and individual due to the membership to certain group or species. Thus far, in general, it is possible to say that the system makes decisions depending on its historical moment, its needs, and the current codes active in its interior that allowed translation. It is about the possibilities that each one of this elements opens to cultural interpretation, to revive the collective memory. It is about polysemy, stereophony, polyphony, a vision that integrates diverse elements to enrich the approximation to a cultural view. While the live elements give way to an endless exegesis like symbols, texts; the signs will be part of the systems semiosis, renewing it and conforming its memory to update contents, to discard those that no longer belong to the living system, but are disarticulated and their codes no longer contain information that allows assimilation of information and may be, also an attempt to rescue those that account yet with a tiny part assimilable to the context of the semiotic individual.

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“The symbol un-grounding problem in language acquisition”

Symbolic reference is a distinguishing feature of human language. Symbolic relations are usually negatively described as lacking correlational or form-based referential relations. In contrast, iconic and indexical signs provide reference due to sign vehicles sharing forms or physical correlates (respectively) with that to which they refer. The irrelevance of shared properties between a symbolic sign vehicle and its object of reference enables sign-sign combination (e.g. of words) into many complex structures (e.g. phrases and sentences) thus able to specify abstract, highly diverse, but precise contents.

In 1990 the cognitive scientist Steven Harnad articulated a worry that had long puzzled philosophers of language and cognitive scientists in general. He called it the “symbol grounding problem.”¹ The puzzle is to explain how arbitrary marks, such as the sounds of speech or the states of a brain, could reliably become correlated to specific referents without determining this mapping extrinsically, i.e. by using symbolic communication to negotiate the establishment and sharing of these correspondences. He asks: “How is symbol meaning to be grounded in something other than just more meaningless symbols?”

Taking symbols for granted and asking how to ground them obscures the very processes that are required to discover their arbitrary/conventional properties. For this reason, we formulate the problem as an inversion of Harnad’s symbol grounding problem and describe it as the symbol *un-grounding problem*. Instead of asking how symbols become grounded we ask how communicating with ungrounded sign vehicles could arise from prior grounded communications. Such an ungrounding process is implicit in language acquisition. Paying attention to the way that prelinguistic infant-caretaker interactions are semiotically mediated frames this process as a transition from an earlier to a later more developed semiotic system.

The question now becomes: How do iconic and indexical forms of communication—which are intrinsically “grounded” due to the sign vehicles sharing features with their referents—enable communication using ungrounded sign vehicles (aka words/symbols). Ungrounding therefore involves decoupling sign vehicle properties from the properties of what they refer to *without sacrificing referential grounding in the process*.

Referential grounding can only be maintained if these prior iconic and indexical relations are in some way preserved in the transition to symbolic communication. This suggests that some of the most ubiquitous cross-linguistic regularities are expressions of infra-linguistic semiotic constraints. But since linguistic reference explicitly discounts these sign vehicle properties this can only be preserved in the relationships *between* linguistic signs. This requirement may help to resolve another apparent paradox: why the least arbitrary features of language are relational—e.g. grammatical—and not sign token properties. *Relations between symbols*—but not sign vehicle (e.g. word) properties—are constrained by the requirements for iconic and indexical grounding.

As Peirce wrote, “Symbols grow. They come into being by development out of other signs” (CP 2:302).

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“The body/tongue analogue: mimesis, body plasticity and the evolution of language in biosemiotic perspective”

This paper develops the notion that a global semiotic lens spanning biology and culture (thus covering the phenomenal processes of life generally) is a particularly vital frame for inquiry into the origin and evolution of language— inquiry which, in its turn, could prove to be the single most important area of study to the work of transcending long-standing dichotomies between biological and cultural studies, and of affirming the perspectival imperative of a semiotic theory of life. This accords with Thomas Sebeok’s own prognostication that the “strategic anthroposemiotics/zoosemiotics dichotomy will stand, just as long as the riddle of the origin of human language remains unsolved” (1). It is from this holistic global semiotic perspective that I approach the object of the origin of language, locating it within a coevolutionary complex whereby biological impulse (bio-/zoo-semiotic), operating through certain physio-anatomical systems of constraint (embodied, kinesio-semiotic), deployed against the ecological forces that ever-define an organism’s peri-personal area (ecosemiotic) could give rise to symbolical insight (anthroposemiotic). It will be argued that evolutionary semiotic processes hinge crucially on the inherent role that mimesis—as the primary mode of information transmission (2)— plays in both culture and biology, in its social imitative sense and in its biological replicative and adaptive senses. A faculty for mimesis will be explored as a requisite preadaptation underlying a capacity for symbolic reference in language (3). The primary intersectional focal point where these processes will be explored is the physiological and potentially coevolutionary interrelation between the brain (prefrontal cortex) and the extra-cephalic constituent parts of the greater whole (i.e. - the human/hominid body) with specific regard to those parts that have exhibited a higher articulative/communicative competence. These would include the semiotically dexterous features of the anatomical periphery (rooted in internal neurological systems) such as eyes, ears, arms, hands and fingers, facial muscles, lips, larynx, and —crucial to the eventuality of linguo-centric human language— tongue, the muscular little stylus that I will argue would be sufficiently equipped to mimetically “underwrite” a truly singular kind of coevolutionary process, one that might culminate in the reified corporeity of mind by virtue of an underlying congruence between lingual and pan-corporeal domains. To this end, it is hypothesized that a mimetic exaptational process could have occurred on the back of a deep structural (or “deep plastic”) analogue existing between the respective articulatory inventories of body and tongue, whereby the gestural plasticity of the tongue (with co-auxiliary support from other speech anatomy) finds articulatory parallel with that of the whole body. These inventories are referred to respectively as *the phono-lingual articulatory range* (PLAR) of the tongue, and the *pan-corporeal articulatory range* (PCAR) of the body in its physio-kinetic entirety. It is argued that the tongue’s PLAR, finding salience through this PCAR/PLAR analogue, could consequently be mimetically leveraged as a kind of semiotic agent for the body, projected as such, via protolinguistic vocalizations, into an emerging, reified world of symbol, where symbolic communication was increasingly offering evolutionary sanctuary to biological survival.

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“Nonphysical symbolic phenomena: Epistemological issues”

Biosemiotics and Peircean/Deaconian sign theory have had an influence on Applied Linguistics at UCLA ever since Donald Favareau introduced them to the field while he was a graduate student. Second-language acquisition (SLA) is a major subfield in Applied linguistics and the study of motivation in SLA has had a sixty-year history during which it has studied integrative motivation, instrumental motivation, self-determination, attribution theory, goal theories, situated motivation, task motivation, willingness to communicate, skill-challenge motivation, value expectancy motivation, the second-language motivation self-system, identity theory, and investment theory.

An interesting thing about the physical human brain is that it can create and process nonphysical entities. It does this with words whose referents are not material entities in the world, but are other words. Such word-word relationships constitute symbolic reference (Deacon, 1997) and the domain that they create has been called the Symbolosphere by Logan & Schumann (2005) to distinguish it from the material worlds of the biosphere and the physiosphere. The symbolosphere contains ideas, ideologies, idealizations, concepts, conceptualizations, constructions, and categorizations etc., which are emergent from the physical world but not reducible to it.

This paper will examine certain semiotic and epistemological issues that have emerged in SLA with respect to concepts (such as motivation and emotion) which we argue are symbolic, conceptual, nonphysical entities that lack any dedicated neural areas or networks in the brain. Symbolic concepts are acquired and processed by the brain but are not necessarily born of the brain. They become neural entities by a process called neural reuse (Anderson, 2014) in which the stimuli from symbolic entities occupy and share brain structures and networks that evolved for other purposes.

Using motivation in SLA is a paradigm case, the paper will make the broader point that, because of their nonmaterial nature, the study of symbolic concepts (such as motivation, emotion, appraisal, identity, investment, engagement, persistence, commitment, enthusiasm, enterprise, determination, initiative, ambition, drive, reason, inducement, inspiration, stimulation, force) have no teleology, can yield no final answers, and no ultimate truths. What they can achieve are interpretations and imputations. This puts psychology and the social sciences, where these concepts are bred, in the same epistemological domain as much of the humanities and the arts. It also raises the epistemological issue of how researchers in the social sciences can determine whether the phenomena they study are of the physical world or of the symbolosphere, and how they will know when they have an adequate understanding of these phenomena.

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“Grasping at the Elephant, toward an interspecies eudaimonism: naturalist epistemic humility and the nature of animal agency”

Endorsing a naturalist view of both ethics and politics needn't be strongly anthropocentric of necessity, as naturalism itself opens to both knowledge and wonder. Looking to William Casebeer's *Natural Ethical Facts* (2003), Fran O'Rourke's *Aristotelian Interpretations* (2016), and an upcoming paper in *The Routledge Handbook of Moral Epistemology*, “normative practices of other animals” (Vincent, Ring, and Andrews 2018). This paper sketches out a neo-Aristotelian—and wholly naturalist—view of the nature of the universe and the lived experience. (The theory underlying this paper extends into Deacon's work on morphodynamics and information and Uexküll's *Umwelt-Forschung*, but the focus here will be on the above three texts.) All phenomenologically entangled in our own different ways, we come at this elephant of being from different directions; the approach developed here celebrates both the hierarchical and the lateral (what Deleuze called arborescent and rhizomatic) understandings of knowledge, these being captured by philosophy and poetry, respectively (O'Rourke 2016).

In this view, knowledge is like a banyan tree: the branches of knowledge ultimately share a common foundation but come at that foundation in sometimes quite different ways—the case of unfamiliar sensorium of the octopus, among myriad others, is illustrative: same trunk of physical constraints and deconstraints and semiotic generals, but a different, more distributed, branching method of cognition. Such a view is perfectly consistent with a long and broadly naturalist tradition in the history of political thought, running at the very least from at least from Aristotle to Adam Smith. What this is *not* consistent with is the long legacy of Kantianism and what has come to be called the naturalistic fallacy; as a result, and to the extent that it contributes to rather than distracts from the central argument, this paper teases out some of the tensions we now face as a result of having epistemically siloed discussions concerning what used to be two essential branches—the natural and the moral—of the same philosophical tree.

In brief: Aristotle is right to call the human a political animal that by its nature seeks knowledge, and that wonderment and theoretical inquiry are the twinned paths to this knowledge; nature is the fount of wonder, and the marriage of poetry and philosophy the means of keeping that wonderment alive. And we *can* in fact look to nature for guidance even about ethical matters concerning human-animal relations. After this reading of Aristotle, through O'Rourke and Casebeer, is established, the rest of this paper takes up Vincent, Ring, and Andrews' discussion of specific normative practices in other social and political animals, comparing and contrasting them with more traditional conceptions of “fully human” moral agency.

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“The elusive evaded interpreting organism”

Biosemiotics has the potential to integrate the physical and life sciences such that we recognize both their continuity and distinctive features. At present however biosemiotics relies on the common assumption in biology that the capacity to evolve is enough to distinguished between physical and life science, and that semiosis is the product of evolution, not its precondition. But evolutionary theory does not explain how the existing interpretive capabilities of organisms can be enhanced or modified to fit changing contexts. In fact, natural selection assumes the prior existence of individuated dynamical systems able to protect, repair, and reproduce themselves; i.e. organisms.

An organism is the only kind of system that engages in functionally fitted effort. It constrains work to fit its defining properties to changing environmental conditions. This "effort" is an essential feature of the semiotic activity of an organism. Any phenomenon can be interpreted as a sign to an organism disposed to produce an appropriate interpretant. And interpretant production is not passive process nor is it intrinsic to an interpretant sign itself. Signs are forms or artifacts not processes or agents. Interpretation is an aspect of the work an organism must channel to ensure its persistent fittedness to its environment.

Self-organization, cybernetic, and replicator theories are also insufficient to explain the origin and nature of interpreting organisms. By collapsing the interpretive character of organism to mere dynamics they each explicitly bracket both the interpreter and the interpretive process from the analysis. The capacity for interpretation emerges out of the self-regenerative constraint produced and maintained by chance-coupled self-organizing systems which prevent their own ending (systems Deacon called autogens, exemplifying a process he terms teleodynamics). This is accomplished through self-repair, self-protection, and self-reproduction which together regenerate critical intrinsic constraints faster than they would otherwise degenerate, given the second law of thermodynamics. Only self-preserving, self-regenerative, self-reproducing systems can evolve. Evolution is not their origin but a consequence of their emergence.

Biosemiotics needs to pay attention to the emergence and essential features comprising interpretive systems, not just the sign-to-sign structure of the interpretive process. Following Peirce's important efforts to eschew the assumed homunculus explanations for intentional relationships common to the psychologism of his day (and ours), semiotic theory has rightly focused on the structure of the semiotic process at the expense of its physical realization. But organism interpreters cannot be merely assumed, they must be explained. Signs do not work to generate other signs. To focus on *interpretants* but ignore *interpreters* will risk falling prey to eliminativism, panpsychism, or replicator theory. The burden is on biosemioticians not to bury the homuncular self, but to explain how it emerges from inanimate chemistry. Without such an explanation biosemiotics risks merely generating redundant terminology readily exploited for equivocation on the very mysteries it is best poised to illuminate and solve.

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“An evolutionary-cognitive model of musical meaning”

“Where words fail, music speaks,” wrote Hans Christian Andersen, while Victor Hugo claimed, “Music expresses that which cannot be put into words and that which cannot remain silent.” There is a long tradition amongst great authors of saying that music picks up where their art leaves off. That music has the capacity to communicate is evident. Music is clearly meaningful, but it is less obviously referential and functional than is language. This abstractness has, in the past decade, attracted unprecedented numbers of cognitive scientists who hope to use music and musical ability to illuminate aspects of human cognition.

In this paper, I take issue with a tendency amongst many of these theorists to rely on adaptationist and functionalist explanations of how musical ability came to exist in human evolution. These explanations risk being only so many just-so stories, while missing a crucial opportunity to expand how we conceptualize the evolution of symbolic behavior so that forms of artistic expression are not required to have a hidden evolutionary function in order to escape the designation of “auditory cheesecake.”¹ By situating the process of meaning-making in the observer/listener and re-embedding their experience in a bidirectional relationship with the perceived environment, we can avoid the prescriptive constraints of functionalism, and elucidate both the origins of musical meaning and of meaning in general.

Drawing on biosemiotic musicology like that of Mark Reybrouck,² I advocate regrounding the semiotic system in its environment and in the body, contextualizing musical meaning within the entire evolutionary history of symbolic behavior.³ I propose a model where musical signs connect the perceiver to their environment through a series of repeated interactions which give rise to a self-organizing system that scaffolds itself to greater levels of complexity. The dynamics that give rise to musical meaning are, I will claim, fundamentally the same as those that give rise to meaning at the level of cells and molecules. In the period of time when a meaningful association is not yet stabilized, such as when a molecule becomes part of a signaling pathway or a musical motive becomes associated with an emotion, it is much easier to see how meaning emerges out of what was once a set of environmental or contextual circumstances. The fact that emergent meaning becomes scaffolding for future meaning is what starts the feedforward loop that concretizes the relationship between sign, object, and interpretant.⁴ Because music is a kind of limit case of maximal abstraction (compared with language, visual art, and other more representational forms of expression), it is a particularly revealing outcome of the evolutionary and developmental processes that drive semiosis and originate all levels and kinds of meaning.

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“Urban environment as a source: An introduction to civilizational biosemiotics”

Recently the urban environment attracted the interest of research. But even the „Handbook of Research on Perception-Driven Approaches to Urban Assessment and Design“ (2018) realized just the semiotics of sound perception. Though, from a different point of view, the entire urban environment is a measurable primary source to reflect biosemiotics in practice – with the help of the books on town-planning. These printed sources give a survey of the methods of civil and industrial engineering to design public space – to understand the spatial construction of public space.

The methods applied to design space are best understood in the context of public monuments. The public space there is designed to direct the visitors to the optimal views. We just can take a movie of the movements, or look at the traces of the visitors in the snow, and we realize the functionality of the design, the stops and the viewpoint of the visitors.

This design meets another aspect of the optimal views. They are also the places to take photographs. Then, when we analyze and classify these photographs, they use a specific set of angle of view to communicate, used by the visitors, to communicate their interest. This may be read directly from the GPS- and EXIF-data of the images. And these data meet the specification of the optical construction of the lenses.

Interestingly, the specifications of the lenses are the same as the specifications of the town-builders. Thus, we have a set of complementary data, to realize the best fit of viewing and acting in such an environment.

The given example intends to illustrate the methods used, to detect systematically the complementary fit of what may be understood as the fit of vision and action in civilization. Further examples show the outline of the entire system of urban design as an biosemiotic-driven environment. This serves as the outline to a curriculum for civilizational biosemiotics.

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“Dialogue and communication in biosemiotics: the Italian contribution”

The paper's main aim is to present the development of approach as a scientific discipline in Italian academic research environment and its contribution to the development of biosemiotics on an international field.

Two names, in particular, have been playing a crucial role in this area: Marcello Barbieri and Augusto Ponzio. When it comes to Barbieri, in the *Introduction to Biosemiotics edited by him in 2007*, according to Witzany's review of the work, “is a key step forward into this dynamic process of creating a new scientific view on a language like structure of the genome organization and storage medium as well as on rule-governed sign-mediated interactions within and between cells, tissues, organs and organisms”.

On the other side Ponzio and his outstanding work focused on the hermeneutics of Thomas A. Sebeok's “global semiotics” conception contributed not only to spread Sebeok's ideas on a larger environment but also to define some of the main characters and the extension of this new research field by pointing out the interrelations between biosemiotics and other disciplines. He has stressed the relation of science to life, the role of dialogue and the connection between sciences dealing with life phenomena and others connected to signs. Moreover Ponzio showed the importance of Sebeok's approach in the context of the general development of studies on semiosis and semiotic systems.

In doing this, he opened a new pathway and put also the basis for future research tasks and objectives.

Both Barbieri and Ponzio stress the role of dialogue, dialogism and communication as core terms in biosemiotics and show how much their applicability may be extended to communication processes both in humans and in non-humans.

The paper will also present the differences of their approach to some “classical” semiotic concepts, starting from Lotman's.

In summation, it will be an attempt to point out the impact their views and outcomes have/are having on further research both in Italy as abroad.

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“Abduction, anxiety and trauma in Sebeok’s “The Semiotic Self” and Kohn’s *How Forests Think*”

Attempts to work out a specifically semiotic analysis of trauma have been curiously sporadic, despite the obvious importance of the topic. The psychological woundedness that sometimes develops after exposure to a traumatic stressor clearly is a product of “fundamental mechanisms of meaning-making in living systems.” But how exactly does this work? In today’s paper, I propose to explore this question in the light of the near-identification Thomas A. Sebeok asserts between hypothetic inference and anxiety.¹ As *the* key sign mechanism of selfhood, where “selfhood” encompasses identities non-human as well as human, anxiety/abduction serves as an “early warning system” making possible the survival of organisms. Dovetailing with Peirce’s insistence that abduction is both instinctive *and* inferential, Sebeok’s insight opens upon a project of interrogating diverse manifestations of abductive imagination across all the phases of a process of traumatization, including pretrauma, peritrauma, posttrauma and recovery. Pursuing this articulation, we might hope to achieve some elucidation of Sebeok’s pronouncement that the semiotic self is ever vulnerable to “communicational errors” that “may have devastating effects” (40).

Sebeok’s work also provides a perspective for considering a different and more recent attempt to analyze trauma in semiotic terms. Eduardo Kohn’s *How Forests Think* (2013) proposes “an anthropology beyond the human” theorized in terms of Peirce’s triad of sign types: icon, index and symbol.² A key moment in the argument is advanced in the form of a personal anecdote, when Kohn tells the story of a panic attack he underwent when he was traveling in a bus in Ecuador after a mudslide-inducing storm. Related in the first chapter, the anecdote helps to explain the larger purpose of Kohn’s book as an attempt to ameliorate the potential psychological and spiritual dangers of symbolic thought, with its propensity “to jump out of the broader semiotic field from which it emerges, separating us, in the process, from the world around us” (44). The turn to an abduction-centered rethinking of traumatization suggests a context both for appreciating the salience of Kohn’s approach and questioning his practice of pitting the symbol against icon and index.

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“Co-localization as the ur-syntax of biological propositions”

In Peirce's doctrine of propositions - so-called "Dicisigns" - a central issue is that of the syntax keeping together the parts of the expressed proposition. In his analysis, Dicisigns have two parts or aspects which he indicates by generalizing the Aristotelian notions of Subject and Predicate. Subjects are those entities referred to by the Dicisign, and the Predicate is the description made by the Dicisign of those entities referred to. So the defining characteristics of a Dicisign is that it, by the same token, refers to some entities and describes those same entities. It is this doubleness which makes it possible for the proposition to state a truth claim - its truth depending upon whether the description offered actually fits the entities referred to. To Peirce, however, language is but one medium among several usable for the expression of propositions - pictures, diagrams, gestures, etc. may enter propositions as well, so that Peirce's doctrine qualifies as a multimodal theory of propositions. This has important consequences for the *syntax* of the Dicisign, holding together Subjects and Predicate. For when propositions are not exclusively linguistic, grammar or linguistic syntax can not bear the burden of synthesizing Subjects and Predicate into one expression.

Peirce realizes this conundrum which is why he, in his later years, develops no less than two different explanations of the "unity of the proposition", one in the 1903 Syllabus, and one in the correspondence with Lady Welby. The former proposes a special self-reference of the proposition to produce the synthesis of Predicate and Subjects; the latter proposes a special deep structure of predicates to be responsible. This paper revisits both explanations and estimates their compatibility. Both explanations agree upon a very basic issue which could be called the *co-localization* of Subjects and Predicate in the Dicisign. The two must be presented in some sense in connection, combined, in proximity to each other in some topological or metrical connectivity space easily accessible to the sign interpreter. A Peircean example is the sign over a door saying "No admittance, except on business". How do we now to which door this predicate applies? We know that because the sign is placed immediately over the relevant door. The Predicate and Subject are co-localized. This is such a widespread and most often easily-processed feature of multimodal Dicisign so as to escape notice. My contention is that co-localization is, at the same time, trivial and deep. Co-localization, this paper argues, is the key to understand the extension of Peircean propositions into biosemiotics.

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“The search image as link between sensation, perception and action”

In this paper, it is argued that Jakob von Uexküll’s “search image” notion, the original version of this notion within ethology, is still of use. A search image, in Uexküll’s sense, is an imagined object that an organism has in mind when it searches for something. Uexküll’s conception of the search image is useful both for understanding the theoretical context of contemporary notions of search images, and with an eye to envisioning possible future developments of the idea. Uexküll’s classical notion differs from contemporary versions in that it has a wider application, and is therefore of greater relevance to theoretical biology and cognitive science. It constituted an integral part of his ground-breaking Umwelt theory, stressing the fundamental plasticity of the Umwelt, the subjective lifeworld of an animal or human subject. In a contemporary development of Umwelt theory, expressed by the tripartite Umwelt model, the search image notion represents a key connection between the directly experienced core Umwelt and the mediated Umwelt. However, the key function that schemata have in cognitive processes is also the starting point for mistakes in perception. This article details both the constructive function search images have in animal and human perception, and the mismatches in perception they can lead to. It also details how the existence of search images can help explain puzzles concerning subjective and neural time in contemporary cognitive science.

⁽¹⁾ This presentation is based on an article written for and published as part of a recent special issue on code biology, edited by Marcello Barbieri and Jan -Hendrik Hofmeyr: Tønnessen, M. (2017/2018). The search image as a link between sensation, perception and action. *BioSystems*. Published online November 4th 2017. DOI: 10.1016/j.biosystems.2017.10.016.

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“Biosemiotic readings in a Norwegian philosophy of science MA course”

This paper presents my experience with making use of five biosemiotic texts in a recently launched Master course at University of Stavanger (Norway), for which I am course coordinator and one out of two teachers. The course is titled «Philosophy of Science and Research Methods» (course code MEE140), and is given in English, with about 40 students registered autumn 2017. It is compulsory in the first semester of the Master program «Energy, Environment and Society» (M-EES), which is aimed at international students but also attracts a significant number of Norwegian students.

According to the course plan the Master program «raises the fundamental questions of what sustainable energy might be and what a low carbon transition might look like from different perspectives.» This implies that climate change and the energy sector’s role in that context is a main focus throughout the Master program.

The course «Philosophy of Science and Research Methods», according to its course plan,

approaches science from different angles: The philosophy of science, including various topics related to science and the environment, and methods applied in social research, with an emphasis on research design. The overall aim is to present current understanding of scientific activities, especially within the social sciences, and to stimulate critical thinking by examining a selection of original perspectives on science and the current state of global ecology. In addition to philosophy and research methodology, the course draws on disciplines such as semiotics, ethology and human ecology.

Here we see semiotics mentioned, and it is implied that biosemiotics constitutes an «original [perspective] on science and the current state of global ecology». In addition to a text book in the philosophy of science, and a text book in research methods, mandatory readings include 11 briefer academic texts, five of which can be characterized as biosemiotic research texts. In addition to an article by myself on the «global species» notion which makes connections between the Anthropocene/global human ecology theme and biosemiotic themes, these include: Excerpts from a book by Jakob von Uexküll¹, «A Biosemiotic Building: 13 Theses»², and two introductory chapters from *Animal Umwelten in a changing world - Zoosemiotic perspectives*³.

A coursework requirement is that all students have to take part in a group work in-class presentation of one of the 11 shorter mandatory readings. This implies that one hour with student presentation followed by discussion and questions is devoted to each of these texts.

Under «Learning outcome», the course plan details that «[s]tudents who successfully complete the course will be able to [...] demonstrate knowledge about historical and current global human ecology, and the perceptual worlds of animals», and «reflect critically on different perspectives on science and the environment».

Initial student feedback suggests that some students were fascinated by this «new perspective», but might need follow-up lectures or courses to apply biosemiotic thinking professionally in the context of this Master program.

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“Biosemiotical sensoperceptual mnemonics in the semiosphere of an ancient sacred dance at Mexico”

Since time immemorial in Mexican culture, the ritual of sacred dance was practiced, which in view of their beliefs and knowledge, became part of their daily life with truly religious reaches. This dance ritual has been preserved to this day through the production and reproduction of sacred practices that have been transmitted by tradition beyond the oral, but also the paraverbal and nonverbal were mnemonic devices that strengthened the forms and contents that have been preserved in the depths of Mexican thought.

Of course, there has been a whole Transcultural dynamic: intertextual and intersemiotic, between sacred practices, Christian institutionalization and even the *new age* religious movements of today, however, in the nuclear texts of the Conchera sacred dance semiosphere, the messages of an ancestral knowledge remain.

This work is part of a wider investigation, framed by the panorama of the epistemology of complexity and with the application of the transdisciplinary theoretical-methodological model, as there are too many arris from where it has been analyzed, one persistent is to consider it as a well-defined semiosphere, therefore, it is inscribed in the semiotics of culture, and for that reason, the mechanisms of the memory of culture act in it. But there are others too, the memories that are activated immediately, those that are at a senso-perceptual level, to which little importance has been given when they are those that prepare all the sacred niche required for the production and reproduction of the ritual. They are low level elements that produce a high level of organization during the event. I refer to the smells that arise from the different incenses (called copal), to the order and size of the candles, the color of the decoration, and the music of the songs; regardless of the fact that in many occasions the rituals are performed in natural environments, where even the noises of wind, water and other surrounding elements become significant for the dance environment, which, as will be noticed, it is not only a body movement dance.

The research includes all these signs as fundamental for the recognition of “conchera” or sacred dance contents from biosemiotics, because it assumes both biological memories and cultures, which make them a substantial basis for the beginning of the survival of this practice up to the present in spite of the enormous universe of strange texts that reaches that semiosphere.

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“On the prehistory of the Tartu school of biosemiotics: a connection with the humanities”

In the (pre)history of many academic disciplines and institutions, there exist important periods preparing the “official” birth of these sciences or academic structures. One of such periods for the modern Tartu school of biosemiotics was that of the semiotic meetings held in the 1960s-1980s in Estonia. These meetings were organised by scholars – specialists in the humanities, but their general atmosphere was interdisciplinary, including, among others, research cooperation with biologists. Therefore, a number of topics and research results from these meetings constituted very fertile ground for the subsequent emergence of a particular school of biosemiotics in Tartu. In the paper, we will consider the epistemological premises for the emergence of biosemiotics in Tartu in connection with the humanities, analyzing for this purpose the texts published in the journal *Sign Systems Studies* when it was still published in Russian and called *Trudy po znakovym sistemam* (1964-1992, 25 first issues).

During this period, among the articles published in the journal there were texts on problems that today can be considered biosemiotic ones – for example, chemistry and biology of speech, human brain and its functional asymmetry. A number of works were devoted to the “dialogue” of natural sciences and humanities in the historical aspect – including articles related to the emergence of a semiotic view of biology, as well as to the “biological” grounds of cultural semiotics. In particular, the journal published texts on the notion of system (cf. with “structuralist paradigm”) as applied to biology and their analyses; on the “biological connection” of Saussurean linguistics, etc. Some researchers showed particular interest in the mechanism of creating the “texts of nature” in Russian and foreign fiction.

The problems of general semiotics were also discussed in the journal: they concerned biosemiotics too (they were questions about the subjective nature of the position of researcher in semiotics; arguments about the problems of statics and dynamics in semiotic systems in general); results and problems of semiotic researches were discussed with the recognition of the fact that semiotics had gone far beyond the semiotics of culture and in general beyond the study of sign systems related to the human language. In this connection, the biological bases of the semiotics of culture were emphasized. The Lotmanian notion of semiosphere was introduced at that time in the pages of the journal by analogy with the notion of biosphere by V. Vernadsky.

Among the authors of the analyzed articles there were both those whose names are well known today (Yu. Lotman, A. Pyatigorsky, V. Ivanov, B. Uspensky) and those who are less reputed (in particular, M. Danilov, D. Segal, I. Revzin, Yu. Skuratovsky, V. Deglin, L. Balonov, etc.).

A part of our paper will be devoted to the analysis of the reflection, in today’s Tartu biosemiotics (at the academic and pedagogical levels), of research problems raised already in the 1960s-1980s.

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“Teaching biosemiotics to students of the humanities: A bittersweet experience”

This presentation gives a glimpse into the situations of teaching biosemiotics to students of the humanities in a Chinese university and proposes a few solutions to the problems that have surfaced. The author uses his personal experiences of teaching semiotics and biosemiotics in five different courses at graduate and undergraduate levels at Nanjing Normal University to elucidate the prospects and challenges of cross-disciplinary education, which is being strongly and widely advocated by the Chinese government and higher education departments in this country. As the earliest research and teaching institution for semiotics, among other relevant areas of inquiry, Nanjing Normal University is known for its comprehensive advancement of the studies of signs. However, like many prestigious Chinese higher education entities that have semiotics-related research and educational projects, such as languages, culture studies, history and education, NNU is still characterized by a decades-old disciplinary division. Properly combining the sciences with the humanities not only reveals great potential and effects of teaching, but also poses considerable challenges to the students of various levels and to the faculty as well. It has indeed proved to be a bittersweet experience. Based on analyses of questionnaires, assignments and in-class interactions, the aforementioned classes the author taught over the past semesters between 2014 and 2017 show some intriguing patterns in students' acceptance and understanding of semiotics, in particular biosemiotics, which was relatively more demanding in terms of terminology, previous knowledge and readiness in class than other courses. In addition, the classes display a culture-related pattern in students' responsiveness to what they term as “ideas from the West”, a commonly seen factor that either inhibit or facilitate the learning of not only biosemiotics, but also various other subjects that did not manifestly originate in Chinese cultures or Chinese academia. For faculty, the factors are even more complex. In addition to responses similar to those of the students, teachers are faced with the necessity of training in such subjects as biology, cognition and neurosciences besides their usual tasks of teaching linguistic signs, culture and social studies if they are involved in biosemiotics. To a considerable degree, this has opened a window of opportunities in a good number of Chinese universities, including NNU, to recruit professional biosemioticians who have expertise in the above-mentioned “hard” sciences and can relate fairly well with students of the humanities.

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“Biosemiotics as an Alternative Paradigm for Biology: A rational reconstruction of the history of biosemiotics”

With decades of hard work done by generations of biosemioticians, biosemiotics has come of age. It means that biosemiotics is mature that has become a paradigm for biology. In the presentation, I will evaluate the claim with Kuhn's account of paradigm as descriptive and empirical criterion and Lakatos' account of scientific research programmes as conceptual and normative.

Neo-Darwinian biology is the predominant paradigm of life science today. However, teleological characters as very defining features of living beings cannot be explained by this mechanistic paradigm. That is to say, neo-Darwinian biology is a life science without living. This is an anomaly of the paradigm. Furthermore, it implies dualism leading to two cultures dilemma. The anomalies may lead to a crisis of biology. Biosemiotics proposes semiotic responses to the crisis.

Biosemiotics is dedicated to explaining the phenomenon that neo-Darwinian biology left behind within the perspective of semiotics, aka, a living or meaning-making aspect of life. The ontological commitments, or, hardcore, of biosemiotics, are Sebeok Thesis and the calling for a natural history of meaning. The ontological commitments provide a new worldview for biosemiotics to study life. Many works have been done to distinguish biosemiotics from other accounts to resolve the attacks on those commitments playing the role of negative heuristics. The two theses also imply the methodology of biosemiotics: the methodology that studies signs. Biosemiotics adopts Peircean semiotic model and von Uexküll's theory of Umwelt.

One of the most important theoretical activities of biosemiotics from its birth to now is to classify biosemiotics through reformulation of biology. Legitimate questions of biosemiotics are defined with respect. Reformulation of biological theories often accompanies with identifying significant biological facts and reinterpreting those facts which have been explained in neo-Darwinian biology. Following, biosemiotics have some advantages over neo-Darwinian biology.

It is clear that biosemiotics meets those two sets of criterion given by Kuhn and Lakatos. Actually, there are some empirical marks showing that biosemiotics has turned to the phase of normal science.

Achievements must have two characters to be a paradigm: a) attract an enduring group, b) open-ended to leave sorts of problems. Obviously, biosemiotics has these two characters: the community of biosemiotics is a small but growing steadily group from different disciplines meeting each other annually and publishing research output around biosemiotics on several academic journals; sets of questions are well defined leaving to open-ended investigations. Esoteric type of research has been established now. The works done by biosemioticians today are more like puzzle-solving rather than fundamental novelty.

However, there are still two challenges waiting to solve if biosemiotics is willing to develop further: internal and external. Internally, under the cover of the same title, there are different approaches to biosemiotics that are not coherent enough with each other. The way to accommodate their conflicts has to be found. Externally, it is still a problem to deal with Darwinian theories. For example, what is the relationship between zoosemiotics and animal signals study? Are they complementary? Or, do we need further ontological synthesis?