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AUTHORS

Affifi, R.	*A Biosemiotic Interpretation of Vygotsky's Zone of Proximal Development*
Albanese. C., Max, C. & Ziegler, G.	*Languaging Universals – The Biosemiotics of Facial Kinetics*
Alexander, V.N.	*Toward a Biosemiotic definition of Chance*
Annoni, M	*Placebo responses in Medicine: Toward an integrated biosemiotic model*
Auletta G.	*In life semiotics goes together with information control*
Bielecka, K.	*Explaining frog behavior with representation*
Böll, MMR	*Brain, Body, Behavior: Integrative Biosemiotics*
Brier, S.	*Peircean biosemiotics as a transdisicplinary endeavor*
Čadková, L.	*Do they speak language ?*
Cannizzaro, S.	*Internet memes as internet signs: A biosemiotic study of digital culture*
Cárdenas-García, J.F	*The biosemiotics of learning and distributed cognition*
Collier J.	*Modelling semiotic systems with an eye on biology*
Cowley S.J.	*The embodiment enigma: can biosemiotics help?*
Denizhan, Y, Ozansoy, M & Karatay, V	*Complexity as sustained Informability*
Fernández E.	*Semiosis and Control — From Biosemiotics to Technosemiotics and back*
Goldberg, L.J.	*Face recognition as a semiotic system*
Goudsmit, A.L.	*Explorations on closure in a domain of dynamic geometry*
Hofmeyr, J-HS	*A linguistic model of self-fabrication*
Ireland T.	*The Spatiality of Being Autonomous*
Kleisner K., Kočnar, T., Havlíček, J. & Akoko R.M.	*Local Specifics and Universal Cues in Cross-cultural Perception of Attractiveness: A View from Semantic Morphology*
Kull K.	*Acquisition of sign relations, or learning: taxonomy and meronomy of signs*

Lancaster L.	*Opening up boundaries: using Social and Biosemiotics to examine how infants construct signs*
Lhotský, J.	*Symbiosis: The pivotal concept for current biosemiotics*
Mäekivi N.	*Communication in hybrid environments: the case of zoos*
Major J.C.	*C.G. Jung - A Semiotic Bio-Logic of the Mind*
Maran T.	*Semiotics meets species conservation: translation and modeling*
Mayer D.	*Three kinds of things – Nonliving, Living and Products: Getting beyond Mechanism*
Miłkowski, M.	*Anticipatory representational mechanisms in animals*
Ostdiek G.	*Science, Signs, Branding and Belief: or, how biosemiotics can save the world*
Pain S	*Propositional Relations and Semiotics of Microbiota*
Rączaszek-Leonardi J.	*'Meaning' is not 'mapping': codes and constraints in semiotic processes*
Hulswit M. & Romanini V.	*Semeiotic causation and the breath of life*
Sharov A.A.	*Protosemiotics: signs without objects*
Slavíková R., Půschel D., Gryndlerová H., Markoš A. & Jansa J.	*Underground encounters: mutual benefits of mycorrhizal partners*
Švorcová, J	*The organic memory concept in 19th-century biology and its implications for current biological thinking*
Targon, V.	*Genome semiotic modelling*
Tønnessen, M & Beever, J.	*Uexküll in translation: "Darwin and the english morality"*
Vehkavaara, T	*Modeling biosemiosis – Two concepts of Sign*
Velmezova, E., Kull, K. & Cowley, S.	*The "Biosemiotic perspectives in linguistics" project in its historical, present and future states*
Weber A.	*"Enlivenment": A program for a first person ecology*
Witzany, G	*RNA-Sociology from a Biocommunicative Perspective*
Zemková M.	*One common structural feature of "words" in protein sequences and human texts*

AUTHOR'S email address

Affifi	*r.affifi@mail.utoronto.ca*
Albanese	*claudia.albanese@uni.lu*
Alexander	*alexander@dactyl.org*
Annoni	*marco.annoni@ieo.eu*
Auletta	*gennaro.auletta@gmail.com*
Bielecka	*kikab@gazeta.pl*
Battail	*gbattail@club-internet.fr*
Böll	*metteboell@gmail.com*
Brier	*sb.ibc@cbs.dk>*
Čadková	*Lucka.cadkova@seznam.cz*
Cannizzaro	*sblissa@gmail.com*
Cárdenas-García	*jfcardenasgarcia@gmail.com*
Chebanov	*s.chebanov@gmail.com*
Collier	*collierj@ukzn.ac.za*
Cowley	*s.j.cowley@herts.ac.uk*
Denizhan	*denizhan@boun.edu.tr*
Faltynek	*dan.faltynek@upol.cz*
Fernández	*marcieli@swbell.net*
Goldberg	*goldberg@buffalo.edu*
Goudsmit	*arnogoudsmit@gmail.com*
Hofmeyr	*jhsh@sun.ac.za*
Ireland	*t.ireland@ucl.ac.uk*
Ji	*sji@rci.rutgers.edu*
Kleisner	*kleisner.karel@gmail.com*
Kull	*kalevi.kull@ut.ee*
Lancaster	*L.Lancaster@mmu.ac.uk*
Leeming	*bleeming@faculty.ocadu.ca*
Lhotský	*josef.lhotsky@natur.cuni.cz*
Mäekivi	*nellymaekivi@gmail.com*
Major	*joaocarlosmajor@gmail.com*
Maran	*timo.maran@ut.ee*
Mayer	*danielcmayer@gmail.com*
Miłkowski	*marcin.milkowski@gmail.com*
Ostdiek	*ostdiek.htf@gmail.com*
Pain	*st3pen@yahoo.com*
Rączaszek-Leonardi	*raczasze@psych.uw.edu.pl*
Romanini	*viniroma@gmail.com*
Schilhab	*TSC@dpu.dk*
Sharov	*sharoval@mail.nih.gov*
Slavíková	*renata.slavikova@gmail.com; Renata.Slavikova@ibot.cas.cz*
Švorcová	*jana.svorcova@natur.cuni.cz*
Targon	*Valerio.Targon@eecs.qmul.ac.uk*
Tønnessen	*mortentoennessen@gmail.com*
Vehkavaara	*Tommi.Vehkavaara@uta.fi*
Velmezova	*Ekaterina.Velmezova@unil.ch*
Weber	*frankandreasweber@gmx.de*
Witzany	*witzany@sbg.at*
Zemková	*misa.zemkova@seznam.cz*
Zheng	*zhengd@hawaii.edu*
Zielinski	*milosz13@gmx.ch*

A Biosemiotic Interpretation of Vygotsky's "Zone of Proximal Development"

Ramsey Affifi

Ontario Institute for Studies in Education, University of Toronto

Vygotsky's influential concept of a "zone of proximal development" (ZPD) describes an accessible window through which socially-mediated semiotic human knowledge and competencies are acquired. Although Vygotsky's concept suffered from logocentrism and anthropocentrism, ZPD can be broadened to incorporate semiotic ontogenic development in other organisms.

A Peircean re-interpretation of ZPD incorporates diverse sign types and diverse species, while retaining the socially-mediated and developmental character of the original concept. A number of implications follow in terms of articulating transactions between organisms, describing the evolution of an organism's Umwelt constitution, ecological dynamics, and in situating human responsibility within these systems..

A broadened ZPD will then be used to outline the following interactional domains:

A. *Non-human ZPDs*

1) elucidating how other species have ZPDs for which conspecifics enable the semiotic development of their Umwelt and their aptitudes.
2) elucidating how other species have ZPDs for which non-conspecifics enable the semiotic development of their Umwelt and their aptitudes.
3) mapping how the ZPD of other species changes in receptivity and capacity over the lifespan of the organism.

B. *Broadening Human ZPDs*

4) recasting the educational goal employing ZPDs to be about human integration into multispecies culturo-ecologies.
5) identifying how other species can be effective scaffolds to assist human learning so that humans better integrate into the larger ecologies.
6) identifying whether stages exist in children within which ZPD is more open to ecologically-mediated development.
7) developing a conception of environmental education such that teachers scaffold child ZPD integration into larger ecologies.

A broadened ZPD can (1) enable humans to conceive an Umwelt as undetermined and dynamic through intercorporeal, socially-engaged activity, extending Umwelt theory beyond Uexküll's Kantian foundationalism, (2) enable humans to position themselves more reflexively and responsibly in unfolding interspecific semiotic systems, and 3) assist in developing environmental educational programs that seek to situate humans in their semiotically-driven ecologies.

‘Languaging’ Universals –The Bio-semiotics of Facial Kinetics

Claudia Albanese [1,2], Charles Max [1,2] & Gudrun Ziegler [2]

[1] *University of Luxembourg and* [2] *DICA-Lab – Dynamics in Interaction, Communication and Activity, Luxembourg* *http://dica-lab.org/*

We call ‘languaging’ the complex-ecological, dynamic core-interaction of multiple semiotic resources to generate (encode and decode) meaning in communication. We discuss the physiological emergence of intentionality and consciousness through bio-semiotic markers of meaning in the form of facial kinetics (Birdwhistell, 1970), with a specific focus on eyebrow movements. We adopt a discursive-interactional approach to a set of ‘semi-interactional’ data, in order to investigate semantic, syntactic and pragmatic aspects of self-organization, bio-communication and anthropogenetics.

A series of thirty-six short, -quasi-monologic- interviews (1.30 minutes each on average) was run on a mixed group of multilingual speakers at University of Luxembourg. Four sets can here be distinguished: twenty participants with different L1s spoke either English or French as L2 (ten and ten respectively). Eight English L1 speakers and eight French L1 speakers spoke English as L1 and French as L1 respectively.

Data analysis reveals that, regardless of whether speakers use their L1 or an L2, there is consistency and systematics across languages, as for the placement of eyebrow movements on self-repair (Schegloff, 1977), material following hesitation and discourse markers (Schiffrin, 1986).

In line with biogenetic structuralism (Laughlin and d'Aquili 1974), these results suggest that, although each living organism develops own ‘cognized’ *Umwelt* (von Uexkull, 1973), there are universal operational structures characterizing human language (Wierzbicka, 1992), and cognition. Aspects in the sequential organization of talk (Sacks, Schegloff, Jefferson) and linguistic-kinesic interdependence (Birdwhistell, 1970) result from complex socio-genetic evolution of interactants’ nervous systems.

Toward a Biosemiotic definition of ‘Chance’

Alexander, V. N.

Dactyl Foundation, NY, NY, USA

I will review the various ways biosemioticians use the concept of “chance” to contend that semiotic systems are irreducible and capable of making “choices” (Favareau, 2010) and briefly compare the way complexity scientists and reductionists define “chance.”

As Jesper Hoffmeyer notes, Peirce believed that “chance and indeterminacy are the primordial condition of the world,” and he thought, therefore, “the task is to explain how ordered structures emerge out of unordered, chaotic diversity” through habit formation, or through what we would now call self-organization (2009; 62-63). According to this view, a certain degree of unpredictability would be an inherent and unsurprising aspect of reality, particularly in the behavior of complex systems where slight statistical irregularities can be exaggerated by constraints.

However, Peirce’s view may not be the accepted norm. Although mainstream science may have exchanged a classical deterministic view of causality for a probabilistic one, many treat the change of circumstance with indifference. Because quantum states are uncorrelated, they lead to statistical regularity, and probabilistic descriptions seem to work well to describe the long-term behavior of quantum mechanical systems. Some suppose then that the behavior of all biological systems can in theory, if not in practice, be predicted from the laws of physics. Accepting probabilistic-determinism, complexity scientists nevertheless argue that effective factors emerge in complex system interactions that produce unpredictability. Nonlinear dynamics theorists (Crutchfield *et al.* 1986) first proposed that “the exercise of will” may be understood as the local structuring of random changes. Intentionality may manifest itself in the peculiar and dynamically stable way a complex system recognizes and uses patterns found in randomness. But precisely how such emergence occurs in the “black box” of complex systems is not explained by complexity theory (Goldstein 1999).

Some biosemioticians may assume the existence of primordial chance and argue that random statistical irregularities are semiotically constrained producing goal-directed behavior and some interpretive freedom. Others may assume macro-level probabilistic determinism and attribute the emergence of unpredictability to semiosis. In either case, or in others not imagined here, definitions of “chance” and “choice,” which are not well defined generally, may perhaps be given a more precise meaning through a biosemiotic perspective.

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Placebo responses in Medicine: Toward an integrated biosemiotic model

Annoni, M

University of Milan, Department of Health Sciences, UNIMI
European School of Molecular Medicine, SEMM
European Institute of Oncology, IEO

People are simultaneously biological and cultural entities. Accordingly, the ways in which meaningful stimuli are perceived, communicated and interpreted in clinical settings may have a decisive impact on the efficacy of medical treatments and patients' quality of life (Moerman 2002; Hoffmeyer 2010). As a growing number of researches on placebo effects demonstrate (Walach 2011, Colloca & Miller 2011b), meaning-mediated responses can be induced to modulate symptoms across several medical conditions and therapies.

However, two crucial issues are now at the forefront of any research aiming at assessing the role of meaning in medicine. The first is the necessity of rephrasing the misleading concept of "placebo effect" as to allow for the distinction and classification of different kinds of meaning-responses (Colloca & Miller 2011a). In this respect, the primary concern of any meaning-based theory of placebo effects is that of accounting for other kinds on known responses that seem to be independent from cognition–such as those elicited through classic Pavlovian conditioning. The second issue concerns instead the difficulty of reintroducing the concepts of meaning and agency within a theoretical paradigm in which explanations are given in terms of causal interactions between molecular substrates or visible neuronal correlates, and in which the production of new evidence relies heavily on large-scale randomized clinical trials (RCTs).

Though RCTs represent a powerful epistemic tool to assess the neat efficacy and possible side effects of new medical interventions, their clinical applicability–i.e. their external validity–has been recently questioned on the grounds that meaning-induced placebo responses may vary by a great deal between research-controlled and real-life clinical settings (Howick 2011). In this talk I will contend that a biosemiotic model based on Peirce's theory of signs provides a superior alternative to other approaches currently adopted to conceptualize meaning-mediated placebo responses. In particular I will argue that Peirce's conceptual triads of sign-object-interpretant and icon-index-symbol can be used not only to elaborate a working model to deconstruct the concept of "placebo effect" into its diverse basic components, but also as a source of theoretical insights for reconsidering the global role of meaning responses in medicine.

In life semiotics goes together with information control

Gennaro Auletta

Pontifical Gregorian University, Rome Italy

Maynard-Smith was surprised by the arbitrary connection that there is between genetic codified information and biological function. To connect codified information with functions and processes that are not themselves codified, is the main character of semiotics in living beings. Such a connection cannot be understood without the ability of the organism to provide forms of control at any scale (it is sufficient to consider the whole process bringing from genetic expression up to the building of a protein). As it was proved by one of the fathers of cybernetics (Ashby), there is no regulation (and a fortiori no control) without the controlling system able to have a model of the system to be controlled. Therefore, any form of biological control is ultimately information control. This establishes the strict interconnection information-sign-function.

The first example is bacterial chemotaxis. It is shown that there are two main circuits for dealing with information, one mapping from the outside (sensorial input) into the inside and the other mapping from the inside to the outside. The latter entails the endogenous, programmed, default-state constraints associated with the organism: it is the way in which the organism tries to assimilate the external environment by selectively sampling predicted inputs. The former represents the changes in the bacterium's state induced by the environment: this is the way in which the organism accommodates the external environment and its inherent fluctuations. Action only makes sense only when it is useful to reach a goal (maximal concentration of sugars for feeding) at a later time. Therefore, this goal needs to be independent of changes in the external states and therefore needs to be genetically programmed. This also justifies the necessity of an endogenous component in chemotaxis. However, even in the absence of a true epigenetic process, the genetic component only represents a part of the explanation for bacterial behavior, which belies its ability to react to unexpected environmental fluctuations. The second example is selenocysteine.

Organisms need proteins of the family of the selenoproteins. These proteins display a very special feature: the amino acid selenocysteine has been found in their sequence but this is not among the twenty canonical amino acids of the genetic code. This means that the cell has to somehow bypass the general system of protein synthesis (has to choose an alternative path) in order to insert selenocysteine in the sequence of selenoproteins. The cell achieves indeed the insertion of selenocysteine through an astonishing and complex control mechanism where many extra partners are involved: secondary structures of RNA and special proteins. Biologists talk abut this mechanism as a natural expansion of the genetic code; as if life, after having closed the needed “vocabulary” used by the genetic code, is constrained to insert a new meaning without being allowed to introduce a new “word”.

The scope of all this machinery is to “recode” the genetic information of the mRNA that codifies for a given selenoprotein. Since there are no triplets left in the genetic code to be assigned to selenocysteine, one of the existing triplets, in particular one of the three triplets that codify for the “stop” signal, is “recoded” into a new meaning (a kind of information falsification). In other words, the organism shows a capability to control its own informational processes (translation in particular) in order to satisfy the vital need of producing selenoproteins. A very high-level and particular form of using “unorthodox” pathways in order to fulfil vital functions.

Explaining frog behavior with representation

Bielecka, K.

Institute of Philosophy, University of Warsaw

Schulte (2011) wanted to show how some “clash of intuitions” in the debate about teleosemantics can be overcome by combining philosophical argument with careful reflection on the empirical facts. I will claim that what lacks in his view is combining the empirical facts in an adequate way, that is the way which scientists and biosemioticians use them. This means understanding how life scientists, such as ethologists, really use the concept of representation and what they explain with it. *Contra* Schulte, only a concept of representation that is useful in explanation of behavior can be vindicated. Only such a concept couldn’t be easily criticized by antirepresentationalists who can argue that a concept that does nothing in explanation is epiphenomenal (as Chemero 2000 or Garzón & Rodriguez 2009). Moreover, showing a distinctive role of representation in explaining behavior answers the “job description challenge” posed by Ramsey (2007).

Schulte argues against Millikan’s teleosemantics, responding to her functional interpretation of what is frog’s representational content. He argues against Millikan’s view because it yields a content ascription that does not include important perceptual properties (being small, dark and moving) and includes irrelevant functional properties (being frog food). Schulte questions the validity of causal-functional explanation in case of frogs by appealing to empirical facts discovered and interpreted by cognitive ethologists and states that a frog is too simple organism to have cognitive capacities that would enable it to recognize flies as its food. At the same time, he accuses Millikan of underestimating the role of perceptual input and *surface properties* of a fly to which frogs are distinctively sensitive (triggered by *size-distance* constancy mechanism). Schulte claims that only distinctive perceptual properties adding frog’s motivation toward an object (a hunger) is required for scientific explanation of frog’s representational content.

I will argue that Schulte’s line of argument ignores the requirements of a satisfactory explanation of frog’s cognitive behavior. The notion of representation he implies is therefore exposed to antirepresentationalist objections. Schulte does not specify any distinctive role of representation in behavior because his theory is framed in terms of narrow perceptual properties – i.e. natural signs – that are only triggering a snapping response. Positing a representation in the frog over and above perceptual properties is against parsimony considerations, and the notion of representation equivalent, roughly, to perceptual properties causally relevant to behavior, is trivialized (Ramsey 2007). Schulte’s description of frog’s behavior in terms of narrow perceptual properties is a good example of inadequate behavior’s description unless the description is in terms of frog’s, but our categories. Describing an animal behavior with a use of our categories seems to be pointless, especially when an alternative explanatory model is on the market. I will defend a kind of Millikan’s solution that uses a concept of consumer of representation in order to show that a representation for a frog should be understood not only in its needs but also its abilities to interpret a sign.

At the same time, this kind of explanation of behavior will rely on ultimate mechanisms (as it’s functional, or adapted), and not on proximate ones (as in Schulte), to use the distinction of Tinbergen (1963). In the conclusion, I will analyze the difference between proximate and ultimate explanations in terms of representation as well.

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Brain, Body, Behavior: Integrative Biosemiotics

Mette Miriam Rakel Böll, Ph.D.

Center for Semiotics, Aarhus University, Denmark

This talk will guide an investigation of :

1) Anthony Damasio's somatic marker hypothesis (Damasio, 1991) that proposes an explanation to human decision-making founded in not only cognitive but also bodily based emotional structures.

2) Jesper Hoffmeyer's redefinition of these markers as semiotic (Hoffmeyer, 2008)

3) relate the two to a "brain, body, behavior"- model of human sense-making.

Both evolutionary and biological aspects of the structures of emotionality will be unfolded and discussed, with a primary focus of integrating the semiotic perspective in an understanding of such research areas as empathy, social interactions and meaning in contemporary neuroscience, ethology and biosemiotics. This talk relates to a work in progress where the over-all purpose is the attempt to map emotions in their continuity from their onset as physiological disturbances all the diverse ways they unfold in the organism through to the experienced feelings, with regards to both the actual bodily foundations as well as the neurological mediations of such emotional structures.

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Peircean biosemiotics as a transdisicplinary endeavor

Søren Brier, IBC, CBS

These days we have competing views on, which philosophical or paradigmatic framework to found biosemiotics. Some are informational, some linguistically, some code-biologically and some on Peircean theoretical backgrounds. It is my thesis that which one we/you chose to build on has consequences for the role you want to give biosemiotics in the ordering of knowledge systems. Some biosemioticians sees biosemiotics first and foremost as an either alternative or complementary definition of biology and some for all the life science to adding primarily areas as agriculture, biotech and medicine. One meta-view to perceive this from is a *multi-paradigmatic* view of interdisciplinarity.

But from where is that possible? It seems to me that the framework for doing this can be either a *postmodern* outlook with multiple knowledge stories. On a *constructivist* philosophy they can be seen as creating multiple realities not competing for modeling the truth of one single reality, but rather as existential and political offers of ways to see and act in the world. From a *perspectivist* and still realistic philosophy you can see the multi-paradigms as complementary views of a hypercomplex reality, which can never be exhausted by any of those reductions necessary to build models of reality.

I will argue that both versions of the multi-paradigmatic meta-views mean that you do not have to commit to connect biosemiotics to the non-life natural sciences in one end of the spectrum and to the humanities and social sciences in the other. Therefore I will suggest a *Transdisciplinary* semiotic view, a semiotically based unity not only of sciences but of *Wissenschaft*. The transdisciplinary semiotic meta-view or framework is based on the sign process as the major reductive unit, which is also the producer of what Deely calls “pure objective knowledge”. This means that semiotic reality is ontologically viewed as before material reality and encompasses materiality as only one aspect of reality.

So far – to my knowledge - only C.H. Peirce has been bold enough to attempt to create such a transdisciplinary framework through the triadic and evolutionary semiotics he developed from his phaneroscopic and mathematically based metaphysics. Deely is attempting to develop a semiotic framework also partly drawing on Peirce, and Brier is trying to combined Pierce with development within second order cybernetic information theory, autopoiesis theory and system science into what he calls Cybersemiotics. Many researchers use the Peirce’s semiotic theory in a partial way inserting another metaphysical foundation than the Peircean.

My view from a Kuhnian influenced - but still realistic philosophy of science view like Peirce’s pragmaticism - is that a consistent Peircean biosemiotics can only be developed on this transdisciplinary basis including phaneroscopy and pure mathematics that is so foundational to Peirce’s semiotic philosophy. Biosemiotics is seen as interlinking the natural and the social sciences as well as the humanities, especially those based on phenomenology.

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Do they speak language ?

Čadková, L

Department of Philosophy and History of Science

This paper challenges the view of language as an abstract, isolated and inanimate system (Segerdahl et al., 2005; Cowley, 2011; Wittgenstein 1993) and as a property unique to humans (Savage-Rumbaugh et al., 2005; Crist, 2004). Considering especially the results of interspecific communication research with *Pan troglodytes* (Fouts, 2000), *Pan paniscus* (Segerdahl et al. 2005) and *Psittacus erithacus* (Pepperberg, 2002), the idea that linguistic ability emerges only in humans seems to be naive (Hockett, 1960). These experiments discovered other language-like qualities that we had not to be able to detect in the natural communication system of subhuman animals (Frisch, K. von. 1971; Diamond, J., 2004).

Most definitions of language try to exclude animal communication from the notion of language a priori, many times by enclosing language in a framework of systems and subsystems. Language as an essential part of our daily-life routine, through we participate in the world, however, seems to be something beyond a strict set of descriptions. Language is the interface between a system of signs and rules of use performed intentionally on a background of culture and the life experiences of speakers. It is time to differentiate language as an object that we explore from language as a lifelike form through we relate to society and culture. It is a part of culture in which we grow up as demonstrated by both human children and bonobos like Kanzi and Panbanisha. (Segerdahl et al., 2005).

The aim of this paper is to establish which characteristics of language are essential for understanding language as an lifelike form (Hockett, 1960; Segerdahl et al. 2005; Cowley, 2011) and to highlight these properties in either a native communication system of animals or artificially established interspecific communication between human and animals. This paper does not maintain that every living being posses the exact same language as humans, but illustrate that language capabilities evolved not only in one species.

Internet memes as internet signs: A biosemiotic study of digital culture

Cannizzaro, S.

Faculty of Humanities and Social Sciences, London Metropolitan University

This paper seeks to explore the empirical potential of biosemiotics for the study of culture. As such, the paper will explore the usefulness of biosemiotics' terms such as 'sign', 'systems', 'nonverbal communication' and 'cyber-semiotic information' in the study of the contemporary cultural phenomenon of 'Internet memes', purported to be found in digital culture.

Internet memes is the name usually given to digital images or videos that become unexpectedly 'famous' on the Web and that are continuously posted, modified and re-posted on the same platform or passed to new users on other digital platforms, to be then re-modified again. Internet memes have been chosen as objects of study because 1) their nomenclature contains the word 'meme', a term which has been used by Dawkins to designate the 'unit of cultural information' (Dawkins 1976). Dawkins' definition of 'meme' is problematic as it misses to account for the semiotic and systemic component of culture; 2) Internet memes are a cultural phenomenon which is rooted in self-organisation, which in turn has been conceived by cyberneticians (Maturana and Varela 1980) as a biological phenomenon. As such, Internet memes may facilitate the exploration of culture in conjunction with the exploration of nature, the kind of study which Sebeok's *Global Semiotics* (2001) and Sebeok and Danesi's *Modelling Systems Theory* (2000) set out to carry on.

The paper will argue that a meme should not be considered as a discrete element of information in a computing fashion. Instead, a meme should be considered as a *sign* (Kull 2000). Therefore, Internet memes are to be conceived as being constituted by signs relations rather than memes. As such, it will be argued that Internet memes are not single units of culture but are entire sign-*systems*, akin to Lotman's semiosphere (2001).

Subsequently, it will be argued that because of their 'viral' component, Internet memes are rich in *nonverbal communication*. However, this paper will propose that the model 'virality' should be substituted with 'orienting behaviour' (Hediger 1981). This is because this latter term allows one to account for culture as a zoosemiotic phenomenon (involving life as semiosis) rather as a mechanism (involving life as a mechanism).

Lastly, this paper will argue that if Internet memes are to be conceived as cultural information, then the very notion of information has to be a *cyber-semiotic* one (Brier 2008). This is because cyber-semiotics allows one to conceive of cultural information as a system being subject both to cybernetic (verbal, nonverbal and technological) constraints and to the semiotic freedom (Hoffmeyer 2008) of the meme's creator.

The biosemiotics of learning and distributed cognition

Cárdenas-García, JF

Cárdenas & Assoc.

This presentation demonstrates the integration of a biosemiotic perspective into the process of learning, beginning with human embryological development. Based on the Peircean school of sign theory (Hoffmeyer, 1996), it yields new insights into the learning process, ultimately showing that learning evolves from reactive to interactive learning. The phylogenetic and ontogenetic development of humans as homeostatic beings requires an interconnection with their surroundings via a limiting membrane that acts as the interface, promoting recursive interactions between them and their environment. The ever-present environment surrounding and subsuming this autopoietic organism is included in defining a basic unit of analysis and is necessary to study human behavior from its embryonic origins.

The human embryo has an important role in phylogenetic and ontogenetic development. Gastrulation, the beginning of morphogenesis, produces embryological growth that changes a bilaminar into a trilaminar embryonic disc that encompasses three differentiated germ layers: the ectoderm, mesoderm, and endoderm. These three embryonic layers evolve into a three-dimensional structure resembling a straw: the endoderm and ectoderm are akin to the internal and external surfaces, respectively, with the mesoderm intermediate to both. The ectoderm is significant as the source of the epidermis, the central nervous system, the peripheral nervous system, and sensory epithelia of the eye, ear, and nose. In short, the central nervous system (brain, spinal cord and the rest) develops as the in-turned portion of part of the ectoderm, with the remaining part becoming the skin and the ancillary sense organs: touch, sight, hearing, smell, and taste. These sense organs allow us access to our internal space and surroundings.

The senses are primary to the progression of cognition and learning of the human organism. Cognition and learning parallel development in the womb and after birth, where learning is viewed as “... in part, a process whereby any animal acquires facility in distinguishing among stimuli from its environment … and to which it must selectively respond” (Holloway, 1981). This quotation supports the claim that the world – our external, dynamic environment – continually bombards us, beginning in the womb, with never-ending stimuli that are multi-directional in origin, varying in amplitude and duration, and multi-source. Our sense organs process these stimuli as parallel signals from which relevant and life-sustaining information is filtered out. Developing an understanding of the cognitive and learning processes that make the flood of sense stimuli comprehensible to us is essential.

A biosemiotic perspective makes this possible, heralding a two-pronged learning process: reactive and interactive. In this presentation, I define and explore distributed cognition as the ability of an organism to interact with its environment for the purpose of satisfying its most basic physiological (internal and external) and social need to survive and sustain itself.

Modelling semiotic systems with an eye on biology

John Collier

Philosophy, University of KwaZulu-Natal, Durban 4041 RSA
collierj@ukzn.ac.za

I use an approach to modelling that was first developed by Hertz for physical systems. Robert Rosen (1991) developed a very similar approach, applying it to complex systems in biology. Both approaches are based on the idea that the logical structure of a model should mimic the causal structure of what it models. This principle can be extended to psychological and social phenomena, especially to semiotics. If so, both biosemiotics and other versions can be integrated as a single discipline with common foundational assumptions. However, if Peirce is right that full-blown semiotics requires thirds, but causation (“reaction”, “brute force between objects”) involves only seconds, then either semiotics cannot be modelled, the Hertz-Rosen approach is wrong, or else Peirce was wrong about causation. I think it is the last. How can causation include thirds?

Conrad and Matsuno (1990) observed that in complexly organized systems boundary conditions cannot be separated from system laws. Collier (2008a, forthcoming) argued that this idea underlies a dynamical account of emergence compatible with Rosen’s approach (Collier 2008b). However many purely physical systems are of this kind (pace Rosen), but they are semiotic only if we accept some version of pansemiosis across all complex systems, including those that are physical. I think that the pansemiotic conclusion would be unfortunate, as it allows semiotic systems that are in no way functional or self-(re)producing.

A special characteristic of living systems is that they are autonomous, i.e., they are organized such that they move towards ends that are likely to preserve them under widely varying environmental (boundary) conditions. I have argued previously at these meetings (and in Collier 2008b, 2011 and earlier papers) that biological autonomy is based in the integrated way that components of a system contribute to its likely preservation, thus making them functional in that there is an end of self-preservation that is generated internally.

The details are a bit technical, but the gist is that this explains the likelihood of selection, and permits Darwinian evolution. I propose that autonomy is required for semiosis, and that other forms of semiosis emerge out of biosemiosis. Autonomy is emergent and leads to irreducible causality in Rosen’s sense. Given that biosemiosis requires autonomy, then this irreducibility is ensured. I will explain how this entails irreducible triadicity, as required by Peircean signs.

My account permits bringing together causality and semiosis into a common model.

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The embodiment enigma: can biosemiotics help?

Stephen J. Cowley

University of Hertfordshire & University of Southern Denmark

The paper uses a moment of language-in-action to argue that cognitive science needs biosemiotics. It pivots on a moment when an air-cadet, Billy, says, “pongo come back”. Not only is nothing gained from comparing this to output in an artificial code but, it is suggested, matters are little improved by use of, say, Lakoff’s (1999) embodied cognition or Clark’s (2008) extended mind. A stronger view of embodiment is needed. Using enactivist work, the utterance-act can be traced to speaker techniques (Bottineau, 2012) deriving from a history of sensorimotor contingencies (O’Regan and Noë, 2001). This, however, helps little with another question: why this now?

“Pongo come back” is prompted by seeing what is hidden; it sets off what, just before, seemed impossible. The quasi-insight is triggered by intense looking. In tens-of-milliseconds, the utterance-act (Cowley, 2008) may be engendered by organic coding (Barbieri, 2003) that, in this instance, fits Billy’s grasp of logical constraints. Language this possesses a dual ontology (Love, 2004; Cowley, 2011) such as that which is emphasised in biosemiotics (Hoffmeyer & Emmeche, 1991; Markoš & Švorcová, 2009). Language is encultured action. Yet, two of Wittgenstein’s (1957) big questions remain. Why, at this moment, does this wording force itself on Billy? And how is it that *this concept* prompts him to go on –to act as if he had discovered a rule? To address such matters, semiosis is not enough: a systemic biosemiotics is needed.

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Complexity as sustained Informability

Denizhan, Y, Ozansoy, M and Karatay, V

Bogazici University and Medipol University, Istanbul - TURKEY

Having observed the insufficiency of the mathematical definition of information in accounting for informational processes in the domain of biology we have resorted to the Theory of Individuation as proposed by the French philosopher Gilbert Simondon (1924-1989). The ontogenetic framework suggested in this theory hypothesises an initial pre-individual reality that is laden with incompatibilities and tension, a state of pure potentiality exhibiting a metastable character. This theory is meant to encompass individuation processes in all possible domains, from physical to biological, and even to psychic and collective, which differ in terms of how preindividual metastability is modified during the course of the process.

Simondon introduces a physical individuation example, namely crystal growth in a supersaturated solution triggered by a single crystal seed, and extracts from it two fundamental concepts: “germ of structure” and “metastable domain”. Last year we have applied these concepts to different biological processes and presented them as informational operations, without going into the conceptual details of how such a physical process could be generalised to the domain of biology where semiotic freedom would be expected.

In this year’s contribution we hope to clarify this generalisation by comparing and contrasting physical individuation processes of passive thermodynamic relaxation (like crystal growth) and biological individuation processes in terms of their operational properties. We will provide examples supporting Simondon’s suggestion that biological individuation –unlike the physical one- involves a sustained capacity of “being informed”, which is achieved by suspending the exhaustion of metastable potentiality. Such an ability of self-limiting and the resulting sustained “informability” seems to provide a better measure of biological complexity than the classical entropy-based one. Simondon draws attention to the parallelism between the evolutionary/developmental direction of complexity increase and a cascade of improved neoteny. It is worth noting the similarity between this assertion and the Peircean statement that “matter is effete mind”.

Semiosis and Control — From Biosemiotics to Technosemiotics and back

Eliseo Fernández

Linda Hall Library of Science and Technology

All organisms are autonomous, self-organizing wholes separated by semi-permeable boundaries from a surrounding environment, which they actively modify and from which they receive free energy, materials and useful information. Across these boundaries, through specialized organs or organelles, conveyances of action and passion are channeled through a system of oppositely directed efferent and afferent pathways. This basic architectural setup seems to be implemented in all living beings and appears to have remained invariant throughout the course of evolution.

In this paper I analyze this abiding organizational scheme in terms of two fundamental processes: semiosis and control. Building on ideas advanced at this forum on previous occasions I propose a unified account of the functioning of semiosis and of controlling and controlled actions, through disclosure of a shared modus operandi common to purposeful and semiotic causation. The present account is based on the realization that semiosis and goal-directed action embody different but complementary forms of relationality. These relational patterns are illustrated with examples from molecular transport in cell physiology and from the functioning of efferent and afferent pathways in plant neurobiology and animal neurophysiology.

Based on the aforementioned interpretation of the relations between semiosis and control I reach a generalized conception of instrumental action that links the expansion of semiotic capacities throughout biological evolution to a concomitant increase in an organism’s powers for causal intervention and active engagement with its environment.

The potential fruitfulness of the ideas here advanced is substantiated through examples of their aptitude for relating and making intelligible some situations and phenomena that were previously deemed disparate. These include similarities and differences between signs and instruments, and also analogies and disanalogies between the evolution of living beings and the evolution of human tools and other artifacts. Further elaboration of these views leads to a novel apprehension of the contrasting features of instrumental action in the general domain of biosemiotics vis-à-vis its role in the anthroposemiotic realms of symbolic and technological culture. I conclude with a reflection on the possible import of this account of the relations between semiosis and control for what appears to be an increasing rapprochement between biosemiotics and second-order cybernetics.

Face recognition as a semiotic system

Goldberg, L. J.

Department of Oral Diagnostic Sciences

Face recognition is a semiotic capability that plays a crucial role in enabling both human and nonhuman primates to interact in collaborative social groups. The function of face recognition is supported by a system of components that work together so that a perceiver, within several hundred milliseconds after seeing a familiar face, is able to both identify the face, and recall elements of the history of past encounters with the perceived. The interaction of these components involves a number of coding operations which supports the transfer of informational elements from one component to another. The phrase, informational elements, is used to indicate that although these elements in themselves are not significant to the perceiving agent, they do nevertheless, contain essential bits of information that are essential to the final formation of the meaningful message. The fundamental function of face recognition is to rapidly deliver information to the perceiver regarding various behavioral characteristics of the perceived person they are facing. In a face-to-face encounter between humans, two major coding processes are in evidence. One involves an internal coding system that supports the movement of informational elements from retinal sensory receptors to visual and memory centers in the cerebral cortex. The second involves an external coding system that allows each individual in an interpersonal encounter to gain access to what might be called the intentional dispositions of the other.

The purpose of this paper is to identify the structural components of the face recognition system and describe the manner in which informational elements are coded, transferred and decoded as they are passed from component to component in the brain of the perceiver. Each component in the face recognition system is an independent structure. The components are separated by physical gaps, and the gaps are bridged by a third independent component that acts as a mechanism to transfer informational elements from one component to another. The components are arranged in a genetically determined architecture that is inherited by all normal humans. The architecture is such that each of the components of the recognition system is aligned in series so that the first in the series is in relationship to the second, the second to the third and so on. The transfer of informational elements occurs in a unidirectional manner and the transfer between each component is mediated by a third system; a bridging apparatus dedicated to managing the transfer of the informational elements.

It will be shown how the transfer in the brain of informational elements among components in the face recognition system supports the view that in every case semiosis requires the existence of two independent systems that are interconnected by a bridging system. The nature of the independent systems, and the manner by which the bridging apparatus enables coded information transfer from one system to another will be discussed.

Explorations on closure in a domain of dynamic geometry

Arno L. Goudsmit, PhD

EDT Maastricht Psychotherapie and
School of General Practice, Medical Department, Maastricht University (NL)

A type relational network between processes in the domain of dynamic geometry has been described and documented. The processes are defined as expanding shapes that create irregular tessellations in two-dimensional geometric space. The processes can be seen to be mutually specifying. There are some resemblances to Robert Rosen's idea of 'closure to efficient causation', which is considered by Rosen as typical of complex systems. However, the processes also contain transitions that seem to happen without being fully specified by constraints. The unspecified part is that which follows after a particular expansion rule has been fully defined and prepared for execution.

Although the rule's impending execution itself is an event that, to an observer, would seem obvious, it actually comes into action without itself being ruled by the constraints that have prepared it. Its onset takes place more or less spontaneously, as a kind of inertia residing within the system. This phenomenon bears resemblance to what Howard Pattee described in terms of proteins that spontaneously fold into enzymes. Likewise, the actual execution (or interpretation) of a rule (or code), takes place as an event that follows a law of nature, and is itself not prescribed explicitly in terms of a rule.

The processes thus described are believed together to make up a complex system, in which writing occurs as a rule governed process, and in which reading, on the other hand, occurs spontaneously. Expansion processes can be seen to develop and differentiate both into movements and into processes that rule and constrain those movements, in a way that enables new constraining rules and new patterns to develop. Thus a differentiation between logical levels can be seen to arise.

Though a working simulation program has been built, the simulation is necessarily approximative and the occurrence of fatal simulation errors cannot be precluded. (Superficially some resemblances with cellular automata can be seen, but the latter are defined as relations between cells in a fixed grid, whereas we are dealing with a process that defines its own grid in the course of its development. Nor can cellular automata be seen to specify and redefine their own rules of movement.)

A linguistic model of self-fabrication

Hofmeyr, J-HS

Centre for Studies in Complexity and Department of Biochemistry
University of Stellenbosch, Private Bag X1, Stellenbosch 7602, South Africa

In the two previous Gatherings I discussed self-fabrication (Hofmeyr, 2007) as a defining feature of living organisms and presented the outlines of a model of the cell couched in terms of a formal system that writes its own production rules, a model that I now call the linguis¬tic model. The model is based on a structural hierarchy of letters, words, sentences (words joined by spaces) and paragraphs (sentences joined by periods) that are analo¬gous to chemical elements, metabolites, macromolecules and macromolecular assemblies. A new word, say “jo”, is built up by concatenating letters and/or existing words by a speci¬fic production rule, analogous to an enzyme catalyst, that is embodied in a sentence such as “join j and o”. Each concate¬nation step therefore needs its own producing sentence. Sentences differ from words in that they are constructed from letters/words (e.g. “join”, “j”, “and”, “o”) joined by spaces (analogous to, say, amino acids joined by peptide bonds).

A word such as “join” can be formed via the intermediates “jo” and “joi” by the sequential action of three sentences (analogous to a short metabolic path¬way). One can therefore define a set of sentences (a “metabolism”) that construct the words that they themselves are constructed from. The first problem to be solved is the construction of the sentences themselves. If this process needs either a mega-sentence such as “join join and j and and and o” or a paragraph rule consisting of a sequence of sentences (analogous to a multifunctional enzyme) then these higher-order structures in turn need their own constructors, which in turn need their own constructors, leading to an infinite regress. The second problem that the linguistic model makes explicit is the necessity for a transition from the description of the sentence (the mention of the string of letters) to the use of the sen¬tence as a produc¬tion rule. The spontaneous or assisted folding of polypeptides into functional enzymes solves this problem in the living cell, and, similarly, the model needs to assume either a meta¬-rule that is regarded as a given (as part of the “environ¬ment”, such as the eval function in programming languages) or another construction that fulfils this func¬tion.

The only way to make the model self-producing is to assume the existence of an internal representation (look-up table, database) of the sequence of words in each sentence and an algorithm (mechanism) for decoding this information, which, of necessity, must be written in another language. Such an algorithm can be written as a paragraph of sentences executed in a fixed order; these sentences are also encoded, thus allowing the algo¬rithm to produce the sentences from which it itself is built. The postulation of a higher-order structure that assembles such a paragraph starts a descent into another infinite regress. The only way to overcome this is to build into the algorithm’s sentences the information needed to assemble them in the correct order (analogous to the spontaneous self-assembly of macromolecular structures such as ribosomes, proteasomes, chape¬rones, etc.).

The last remaining problem is that of decoding: how to translate the coded representation of the word sequence in a sentence into the sentence string itself. First this of course requires the rules of code and, second, the implementation of these code rules in a set of adaptors that link words with their encoded representation (Barbieri, 2003). Adaptors them¬selves must be sentences, produced by the system, that link the two independent languages of the code. An attempt at solving this problem will be described.

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The Spatiality of Being Autonomous

Tim Ireland

Bartlett School of Graduate Studies, University College London and Leicester School of Architecture, De Montfort University.

Living things are conditioned by their spatiality. Organised by purposeful activity a subject’s niche is a habitual condition effected at one scale by differences across boundaries and scales of composition (Hoffmeyer 2008, 1998) and at another by differences to which a subject reacts and has intention towards (Uexküll 1934). A subject’s intentionality transcends through meaning to define organisation, creating a pattern encompassing bodily structure and behaviour. This ‘lived-space’ (its niche) is comprehensible: it is ordered. Conceived to be the embodiment of intellect (Kirsch 1995) this ordered space is a pattern (or form) of inhabitation and articulates what may be termed the subject’s ‘spatial intelligence’ (van Schaik 2008).

The semiotics of Charles Peirce, coupled with the triadic spatial code of Henri Lefebvre defines an aid through which to analyse habits of action (Määttänen 2007). It is proposed that by considering a subjects spatiality biosemiotically we can not only analyse habits of action, but we can test and evaluate spatial scenarios. In so doing we may establish a spatial model which enables designerly thought the capacity to configure space in a manner which embraces the spatial intelligence of the subject. All living things dwell, and in so doing affect their environment in some way. Various organisms have developed the capacity to modify their environment in such a way that they construct artefacts. These structures embody the subjects intelligence, and whilst human beings may be understood to create artefacts 'par excellence' their constructs are ingrained by patterns of inhabitation. Concerned with the problem of spatial configuration in architecture (and thereby human activity), it is argued that 'human-space' maybe comprehended by “extending the problem downwards to the pattern recognition and control processes of simpler organisms” (Pattee 2005, p281), on the premise that “the very simple mechanisms we see at play in single celled organisms lead to higher and higher degrees of what we call sign processing” in human beings (Favareau 2010).

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Local Specifics and Universal Cues in Cross-cultural Perception of Attractiveness: A View from Semantic Morphology

Karel Kleisner[1], Tomáš Kočnar[1], Jan Havlíček[2], Robert Mbe Akoko[3]

[1] Department of Philosophy and History of Sciences, Faculty of Sciences, Charles University in Prague, Czech Republic

[2] Department of Zoology, Faculty of Sciences, Charles University in Prague, Czech Republic

[3] Department of Sociology and Anthropology, Faculty of Social and Management Sciences, University of Buea, Republic of Cameroon

The human face is a complex semantic organ shaped by various selection pressures in human evolutionary history (Kleisner 2008). Faces display not only reliable information about the bearer’s sex, age, attractiveness, health, and so on but also represent a dynamic interface on which intentions are actively read and onto which expectations are projected (Zebrowitz and Montepare 2008). Cross-cultural studies on attractiveness show notable agreement in perception of beauty across different populations (Penton-Voak et al. 2004, Langlois et al. 2000). At the same time, individual populations vary in their facial morphospace, i.e. the space of facial configurations of individuals that belongs to a particular population. The characteristics of such a facial morphospaces are affected by genetic make-up, subsistence, population health status, environmental conditions, quality of life and further biological as well as cultural factors.

We assume that facial structure of particular populations would reflect adaptation to local social and environmental conditions. However, are these local adaptations also congruent with facial features preferred by sexual selection? If so, the criteria of beauty in different cultures should be significantly closer to the population average of a particular culture. To test this hypothesis we used facial photographs of participants from three different cultures (Czech Republic, Namibia, and Cameroon). These photos were judged for attractiveness by individuals of their own culture as well as by foreign raters. For each culture, we measured distance in facial morphospace between population average and estimates of attractiveness preferred by local and foreign raters. The result of this cross-cultural comparison as well as the evolutionary and social consequences of this study will be presented. In our contribution we will also discuss the application of geometric morphometrics to study of perceptual diversity and evolution of semantic organs.

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Acquisition of sign relations, or learning: taxonomy and meronomy of signs

Kalevi Kull

Department of Semiotics, University of Tartu, Estonia

A role of biosemiotics is to build a theory of general semiotics. Its obvious task is to provide at least the basis for a fundamental typology of signs. However, until now the identification of basic sign types has not been related to a classification of particular mechanisms of meaning making that could be studied independently. To make a further step in this, we attempt to develop the approach of T. Deacon, adding some results from the studies of the mechanisms of learning (e.g., B. R. Moore).

All sign relations are acquired by organisms via a process that can be generally called learning. This includes various patterns of behaviour that become regular due to changes in different kinds of scaffolding, or memory, be it genetically, epigenetically, socially or linguistically inherited. All these scaffolds as well as sign relations are built or designed or taken into use by organisms.

Following S. Meyen, we make a distinction between the taxonomic and meronomic classification of signs. Taxonomy and meronomy (or mereology) are two complementary approaches to classification. Meronomy is a classification of parts of a whole, division of a whole into merons. This results in the formulation of a structure called archetype. Taxonomy joins objects into taxons (taxa). Homologization of archetypes allows the comparative study of taxa and building of a system of taxa. The Peircean meronomic classification of signs has to be triadic, while a taxonomic classification has no such limitations. The taxonomic approach makes it possible to connect the types of signs with specific mechanisms of learning. We can add into the taxonomy a new type of signs — emonic signs, which are the basis for imitation and social learning, being more complex than indexes and less complex than symbols. Icons are based on trial-and-error learning, indexes on conditioning, emons on imitating, and symbols on naming.

Further terminological work will be required in order to separate the meronomic and taxonomic classifications of signs.

Opening up boundaries: using Social and Biosemiotics to examine how infants construct signs

Dr Lesley Lancaster

Education and Social Research Institute, Manchester Metropolitan University, UK

Historically, the natural and social sciences have had an ambivalent relationship. Post-modernists tend to regard science as a bastion of positivism, accusing fellow social scientists of applying what Hayek (1952) called ‘mechanical and uncritical applications of habits of thought to fields different from those in which they have been formed’ (15-16). At the same time, areas of the social sciences have also suffered from what Lather (2005) describes as ‘physics envy’, holding up a narrow idea of rational, objective, scientific method as the gold standard of research. As Erikson and Gutierrez (2002) point out, this tends to stereotype, with most real scientists in their daily work being anything but disinterested and canonically rational. Doubtless many natural scientists also have equally stereotypical views of what social scientists get up to. Either way, this uneasy relationship has set up boundaries between the natural and social sciences, as well as between different paradigms within the social sciences that militate against productive collaboration.

In this paper, I shall argue that research into the early symbolic activity of children has not been well served by social scientific methods and paradigms, and discuss a study of graphic sign making by two-year-old children that draws on a collaboration between social semiotics, biosemiotics, and phenomenology, particularly as exemplified by the work of Gunther Kress, Terence Deacon, and Maurice Merleau-Ponty. The signs produced by the children, whilst not yet conventional in relation to systems such as writing, drawing, and mathematics, were nevertheless systematic and intentional in relation to meaning and reference. I shall argue that such evidence has resulted in useful and original insights into the ways that children of this age engage with principles of symbolic reference that underlie the representational systems used by human cultures.

Much research into the cognition of infants and young children has been driven by psychological, thinking that is redolent with the kind of narrow scientism referred to, supporting a view of cognition as a solitary, mental process with learning involving the individual accumulation of knowledge over time; a clear division is posited between what goes on inside the ‘mind’ and what happens outside. Hutchins (1995) argues that this goes back to the early days of cognitive science when ‘messy’ things such as culture, history and emotion were set aside to be dealt with once individual cognition was properly understood. Using video evidence from this study, I shall argue that evidence about cognition suggests the contrary, and in relation to children’s early sign-making it is widely distributed.

I shall focus on three features of the structure of the children’s signs that have been elucidated through this disciplinary collaboration: that they are multimodal, with children acknowledging no boundaries in their construction, drawing significantly on bodily resources, and resources from their lived environment; that they reflect a process of grammaticisation, whereby basic conceptual categories are derived from physical and bodily regularities, evolving into predictable semiotic structures; and that signs are isomorphic, referring to the means of reference itself, as well as to things in the real world.

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Symbiosis: The pivotal concept for current biosemiotics

Lhotský, Josef

Department of Philosophy and History of Science, Faculty of Science, Charles University in Prague, Viničná 7, Praha 2, Czechia, 12844

The science of biosemiotics is poised between natural sciences and humanities and it is this contact-allowing position what constitutes its main advantage or research power. However, on the other hand, such location in the interspace of two already well-established fields with their sophistically evolved vocabularies is a starting point for problems of mutual misunderstandings. As a matter of fact, the worst situation is when some terms (some key terms) are in common usage. Definitely, this is the case.

There is a number of such terms of varying degrees of meaning, and therefore of various level of importance for various researches: among the most crucial are the terms such as code, meaning, body, subject, process, analogy, interpretation and so on. Here I suggest the essential attempt to „cleaning up the registry“ in order to reduce some of the fundamental misuderstandings in common meeting points“, where biology and biosemiotics are often talking at cross-purposes. This is, I believe, because of generally overlooked nature of Life, which consists of (or, rather, is continually created from) duality of both „permanent“ and „temporal“ – processes, as well as structures (cf. eg. evolution vs. development or phylogeny vs. ontogeny debates).

Moreover, due to the general nature of biosemiotics which is the study of communication systems on the level of signs and their meanings in living beings, I argue that the most appropriate model for biosemiotic research are the symbiotic interactions. Biological systems under such tight ties contain both virtual „understanding of information“ and the „corporeality“ of such processes. Thus, at least some symbiotic events in evolution, especially the phenomenon of endosymbiosis, combine all important aspects for demonstrating the main principles under which can biosemiotics be unified as a coherent attempt to modeling some of the relevant, but so far neglected characteristics of life.

Communication in hybrid environments: the case of zoos

Nelly Mäekivi

Tartu University, Department of Semiotics

Hybrid environments create complicated communication situations — scrutiny of environments where people and other animals meet and where nature intersects with culture need specific approaches that are able to consider different facets contributing to composing the subject matter under scrutiny. There already exists an elaborate subdiscipline of biosemiotics that likewise functions as a bridge between natural and social sciences and in addition enables to study intra- and interspecies semiotic phenomena — namely zoosemiotics. Furthermore, the study of ecosemiotics enables to incorporate biological and cultural aspects in exploring different hybrid communication environments.

This presentation is driven by a profound interest in the possibilities at the disposal of the researcher emerging at the intersection of ethological and anthropological zoosemiotics and in cases where also biological and cultural ecosemiotics have to be reckoned with. It discusses what it means for ways of interspecies communication between human and some other species, when taking into account the cultural perceptions and attitudes towards the species under consideration, and also how communicative abilities of different species influence those cultural perceptions. To better illustrate the point at hand some examples from zoological gardens are brought. Zoos as hybrid environments are shaped by people, but as conservational institutions they have to meet the requirements of captive animals. However, the differences of Umwelts of various species and the extent that their communicative abilities do or do not overlap with ours are major issues in creating the hybrid environment for those different species. This designed environment in turn shapes the possibilities for communication — enabling and disabling certain aspects (whether intentionally or not). It becomes evident that in this hybrid environment anthropological and ethological zoosemiotics are interdependent, as are biological and cultural ecosemiotics. Considering these interdependencies give a more thorough understanding of a subject matter that takes interest in humans and other species and their communication in hybrid environments.

C.G. Jung - A Semiotic Bio-Logic of the Mind

J.C. Major

Department of Psychology, Portuguese Catholic University

“In view of the structure of the body, it would be astonishing if the psyche were the only biological phenomenon not to show clear traces of its evolutionary history, and it is altogether probable that these marks are closely connected with the instinctual base. Instinct and the archaic mode meet in the biological conception of the ‘pattern of behaviour.’” [C.G. Jung (1947). *The Structure and Dynamics of the Psyche*. CW, par. 398]. Along with Uexküll, Sebeok, Bateson and others, Jung appears as a main reference to understand the logic of the living. In fact, the human mind shows traces of our evolutionary history and these *a priori* categories

reveal clearly an intentionality, a kind of intentionality very old, much older than what we today call by consciousness and its attributes.

As Jung puts it, they are not just relics or vestiges of earlier modes of functioning; they are ever-present and biologically necessary regulators, revealing clearly a profound meaning and purpose inscribed in our own flesh. Jung's analytical psychology presents itself as a true biosemiotic approach of the mind or psyche, a framework that permits identify these bodily, unconscious and semiotic regulators or dominators in order to better understand the human being and better deal with him clinically. From the semiotic point of view, biosemiotics and analytical psychology share many concepts: both looked for the biological foundations of our behaviour, and both found semiotic backgrounds, a meaning buried in the depths of our flesh. A real *bio-logic.*

"The nature of the archetypes, the complexes, the role of dreams, relationship between ego and self … all of these deeply 'Junguian' concepts are actually supported by what brain science, the science of animal behaviour, paleontology and similar fields have discovered. Working out the details in all of this really does give us a Jung for the twenty-first century, one whose views are dependable, not only because Jungian analysts say they are effective in the consulting room, but also because laboratory work links them solidly with the biology of the human organism." [Haule, J.R. (2011). *Jung in the 21st Century: Evolution and Archetype.* London and New York: Routledge, p. X]. It seems to us that a bridge between biosemiotics and analytical psychology may be favourable for both disciplines towards a broad understanding of what makes us human. This talk intends to launch the issue and suggest some current and upcoming pathways.

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Semiotics meets species conservation: translation and modeling

Timo Maran

Department of Semiotics, University of Tartu

According to a survey of scientific literature, there is currently not much contact between semiotics and species conservation. Establishing the connection could be, however, favorable to both disciplines as semiotics could help to articulate the role of sign processes in species conservation and species conservation could serve as a practical application and test area for semiotics. A semiotic approach would consider species conservation as a type of interspecific relation, more specifically, as interspecific care (Bouissac 2004: 3394). At the same time, species conservation is related to several semiotic capacities that are characteristic to humans: a) value decisions and argumentation (which species to protect and why); b) studying life conditions and needs of other species; c) communicating conservation aims to general public. Species conservation thus includes intrinsic semiotic competences, although these are rarely discussed by using explicit semiotic terminology.

In this presentation I will focus on the possibilities of and problems in communicating the conservation aims and practices in species protection. The process of explaining scientific knowledge can be analyzed by using the terminology of translation and by distinguishing different stages, strategies and addressee groups (Callon 2005). In this context, the role of charismatic and flagship species is noteworthy (Barua 2011). Secondly, I will discuss efforts of species conservation to model animal–environment relations. This is especially relevant in the restoration of species. Survival of released individuals may depend on epigenetically heritable information, which brings along the need to model and possibly enhance the animals' capacities of finding and/or catching food, predator-avoidance a.o. (Candland 2005). Many aspects of species conservation (e.g. population genetics, legislation) remain far from semiotics. Both topics discussed in this presentation, however, have a common semiotic feature — managing relations with *other semiotic sphere* (Lotman 2005), and this can be analyzed with semiotic tools.

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Three kinds of things – Nonliving, Living and Products: Getting beyond Mechanism

Daniel Mayer

National University, School of Business

What is the flaw of mechanicism? This paper examines the formal differences and similarities between nonliving, living, and produced being according to the fundamental criterion A=A. Max Weber observed in 1918 that the disenchantment of modernity resulted from Newton's causal mechanicism. *Re-enchanted Science* (1996)[1] examines budding holism: Jakob von Uexkull, Max Wertheimer, Kurt Goldstein and others who bathed in Goethe's early rejection of the Newtonian worldview. Today this rejection blossoms in various fields represented in *Beyond Mechanism: Putting Life Back into Biology* (2013):[2] emergence, systems biology, biosemiotics, teleodynamics, epigenetics, etc. In his Forward, Stuart Kaufmann calls for *re-enchantment*. Yet mechanicism, first and foremost metaphysics, remains with us, *in* us. Says one of the book's editors: "Although it may be "irksome" for many biologists to "do metaphysics," metaphysics simply cannot be escaped. We cannot somehow step outside of ourselves to experience the world in some purer way, or render it intelligible without the employment of some set of concepts…"[3] To live is to make the world intelligible is to do metaphysics. The foundational *a-priori* is A=A.

By A=A living being responds to events as tokens of types. Treating concrete particulars as abstract generals, response to X is a response to a token of the type 'X.' *For* a bird, *this* seed is 'a seed;' so is a target level of glucose for a bacterium along a glucose gradient. Necessarily involving arbitrariness, this semiosic kind of determination pertains to living being. Unfolding inheres in such being, bringing about the production of products. Nonliving being *is not* – save experientially *for* living beings, by A=A. Mechanicism would omit that concrete independent particularity of nonliving being(s) results from living *distinguishing*, through A=A. Once distinguished, effects of nonliving X and Y upon each other are of concrete particulars upon concrete particulars. As distinguished, nonliving being is always already semiosic: it is the subset of the semiosic that sufficiently sustains the (mechanistic) omission of distinguishing to be regarded as causal. While randomness enters into causal determination, it is set apart from semiosic determination by arbitrariness.

Thus, by A=A, living being constitutes nonliving being experientially *but not materially*, in sharp contrast to the joint experiential and material constituting by which living being self-constitutes and – crucially – by which it constitutes produced being. Produced by living being, products involve A=A. These also treat concrete particulars as abstract generals. Again arbitrariness: in a clock, 9 o'clock today is a token of "9 o'clock." Through the A=A of living being, products are both materially produced and experientially constituted. Materially, a clock works because it is built by A=A; experientially, it is "clock" by A=A. By conflating it with produced being, mechanicism inadvertently exports to nonliving being the A=A that products derive from being produced. Thus is the material concrete independent particularity of products attributed to nonliving being(s). So appears a reality of objects supposed to be independent of subjects by elision of A=A *out of which* subjectness is obliged to emerge and be made intelligible!

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[1] Anne Harrington, Princeton University Press.

[2] Brian G. Henning and Adam C. Scarfe, eds., Lexington Books.

[3] Adam C. Scarfe, *op. cit*. p31

Anticipatory representational mechanisms in animals

Miłkowski, M.

Institute of Philosophy and Sociology, PAS

Some of animal behavior can be explained by appeal to their internal or mental representations. For example, it is usually agreed that rats are capable of path integration (even in complete darkness, and when immersed in a water maze) because they maintain a cognitive map of their environment. Exactly how and why neural states give rise to mental representations is a matter of an ongoing debate. The purpose of my talk is to show that anticipatory mechanisms involved in rats' cognitive maps meet Ramsey's (2007) "job description challenge": it is clear in what way they are *representationally* relevant for explaining and predicting rats' behavior.

First, I introduce the idea of anticipatory representational mechanisms, which is used to analyze the current research in ethology, cognitive science, and neuroscience. Representational mechanisms (Miłkowski, 2013) have at least the following capacities: (a) referring to the target (if any) of the representation; (b) identifying the characteristics target; (c) evaluating the epistemic value of information about the target. While the first two capacities bear close resemblance to traditional notions of extension and intension, the third one is supposed to link the representational mechanism with the work of the agent or system that peruses it. Such mechanisms are representational in that that they enable the system to detect that it is in error (via evaluation of the epistemic value) and they are prone to misidentification of targets because of the referential opacity. Both aspects, namely system-detectable error and referential opacity, are the basis for the causal relevance of content in representational mechanisms.

The anticipatory representational mechanisms have an additional capacity to anticipate the future characteristics of the represented target (the question whether such anticipation is strong or weak in Dubois (2003) sense is left open). Anticipatory capacities are posited widely in current cognitive science (Pezzulo, 2008, 2011) and they have deep connections with several foundational ideas in biosemiotics, in particular with Rosen's anticipatory systems (Rosen, 1991, 2012). I will claim that even weakly anticipatory mechanisms in my sense meet Ramsey's challenge, and that taxis behavior in animals does not. This suggests that the presence of anticipation is also strong evidence for the presence of representation in observed animals.

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Science, Signs, Branding and Belief:
or, how biosemiotics can save the world

Gerald Ostdiek

Charles University in Prague

As an aspect of signage, the concept of metaphor is generally given a loose, ascientific depiction but powerfully consequential implications. Mirriam-Webster tells us that this word refers to a thing that is "representative or symbolic of something else, especially something abstract." This would mean that there is no meaning that is not part metaphor. One cannot do science with a concept so vague, yet the size of its consequence demands the attempt. Moreover, it is the science of biosemiotics that has the most skin in this particular game: the association of semiotics with 'mere' metaphor is commonly invoked to reject the findings of biosemiotics. This essay does not seek to solve (functionally end) the conundrum posed by metaphors, but does attempt to 'brand' certain entailments of semiotics as biologically meaningful, as making (bodily) sense, as well as metaphor.

We begin by defining the function of (proto-) science in terms of pragmatic biosemiotics, that is, as a necessary aspect of how living things practicably go about living. This invokes questions of belief – that propensity to action that 'steers' man and amoeba alike. But biosemiotics is not only interested in process semiosis, the binding of interpretation into object that is ubiquitous to all life; its premise demands a concern with that which unites the many scales of living experience into singular expressions of human culture, be they Opera houses or Petri dishes. Here we find perhaps the most significant claim ever made upon that ancient trope "how is it we are here?" But 'answering' such a question is not enough, neither is convincing others of what we 'know' about it – it is usage that we seek. As Chauncey Wright argued, the greatest possible certification of truth for any hypothesis is its successful use. As such, this essay proposes a specific manipulation of semiotic response: a 'branding' – which is the act of 'domesticating' an otherwise 'wild' symbol. The intention is a deliberated exaptation of the features of a long-established and 'living' symbol to serve as a binding interpretation, a metaphor capable of functioning as an object of both science and culture.

By way of method, this essay proposes a new shape for Euxkull's function-circle, largely drawn from Peirce's Evolutionary Love, but strongly influenced by works as disparate as Stephen Jay Gould, George Lakoff, Thomas Kuhn, and Jane Jacobs. The upshot is that a biology that remains heartless is unequal to the demands of today's science, while the proposed shape of biosemiotic function offers good science, solid biological metaphor as cultural touchstone, and a palliative for the fear of metaphor and meaning alike.

Propositional Relations and Semiotics of Microbiota

Stephen Pain
st3pen@yahoo.com
c/o Peter Madsen, Sleppevangen 24
5270 Odense, Denmark

In recent years research especially in the fields of virology and bacteriology has challenged much of the traditional paradigms in the natural sciences, testing in many ways the holistic view point of what it is to be an animal or human. I shall in my paper look at the structural and dynamic relations in semiotic explanations and natural systems, drawing on the theory of propositional relations (Alfred North Whitehead and R.G. Collingwood (particularly his essay on metaphysics)) and on my own pragmatic theory of resemblance and similarity.

The epistemological consequences of the new research such as paleovirology , the expanding field of microbiota studies (1) and macroevolution in general also to a certain extent, place a strain on the Darwinian and NeoDarwinian evolutionary explanations. Indeed there are several instances of putative Lamarckian evolution (i.e. passing on of traits that arose in the life time of the parent). This will also be a subject of my paper. The primary "case studies" will be avian influenza and human influenza viruses. The former has been in the news and continues to be a cause for concern since it was the agent for the 1918/19 pandemic (2)

The communication and organization of these viruses and their hosts will be analyzed in terms of the above theoretical approaches. Furthermore, I shall discuss the status of the signal in the cycle of a virus, the nature of the sign in relation to symptoms, and the rhetoric used in the relevant fields in relation to a virus. On top of this I shall seek to construct practical models useful to biosemioticians and scientists alike in their work with microorganic entities such as viruses. What is the relationship of a virus to a cell, and what of its relation to a duck or a chicken? These are simple questions, but the answers to them are profound with enormous implications for both biology and zoology.

(1) http://www.nature.com/nature/focus/humanmicrobiota/index.html

(2) http://www.who.int/influenza/human_animal_interface/en/).

‘Meaning’ is not ‘mapping’: codes and constraints in semiotic processes

Joanna Rączaszek-Leonardi

University of Warsaw

An increasing number of researchers admit that life requires semiotic processes (Pattee, 1969; Sebeok, 1999, Hoffmeyer, 1996; Barbieri, 2003). But what exactly is the role of signs or symbols in the process of adaptive increase in complexity of living beings, and what are the mechanisms that make signs or symbols indispensable is still a matter of considerable debate (Favareau, 2006).

In this paper I claim that two processes are often conflated in the explanations of information in biological systems: one is ‘coding’, which is based on mapping of one set of entities to another, and the other is ‘meaning’, which is based on a relation of constraint between dynamical events and symbolic entities (see e.g., Pattee, 1969, 1982; Pattee & Rączaszek-Leonardi, 2013). This confusion seems to be present both in the explanations of semiotic processes in a cell and in natural human language. Being a psycholinguist, I will show the reasons for being careful about this conflation in the latter, where “*The view of linguistic communication as achieved by encoding thoughts in sounds is so entrenched in Western culture that it has become hard to see it as a hypothesis rather than a fact*” (Sperber and Wilson, 1986, p. 6). I will show that rejecting this view, i.e., thinking about meaning in terms of constraining relation and not in terms of mapping between two sets of well-defined entities makes it easier to account for many “problems” in linguistic theory of meaning such as grounding, efficiency and context-sensitivity.

However, this turn in thinking about meaning does not eliminate the notion of coding from the explanations of semiotic processes. The preliminary conclusions from the natural-language domain is that while for clarifying the concept of meaning it is indeed necessary to specify the relation between symbols and dynamics, and not two sets of stable entities, another process, namely the process of transmission of constraints in time and space may be based on mapping. Thus the replication of constraints, propagation in various media, might require coding. It is thus possible that for the explanation of semiotic processes in living being we need both 1) constraining and 2) replication of the constraining structures that involves coding. Since this conclusion was reached on the basis of research on natural language, the Gathering would be a natural place to check its generality: i.e. to ask biologists in the audience if a similar distinctions can be made at the level of a cell, and if it may be similarly misleading to talk about genetic information solely in terms codes, without referring to its constraining function.

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Semeiotic causation and the breath of life

Menno Hulswit and Vinicius Romanini

University of São Paulo (Romanini); Independent Scholar (Hulswit)

Following Peirce´s semeiotic and theory of causation, we will argue that the distinctive character of life is its being a semeiotic process grounded by the flow of causation. Living organisms are characteristic examples of processes directed toward general end states, that is, states that represent habitual dispositions to behave in the future according to successful past experiences. Familiarity and memory provide the necessary information to denote correctly the objects of attention of daily experience, without which no living being would survive.

To be able to have such dispositions to act coherently, the teleology of living beings must involve a combined action of final causation, efficient causation, and chance. All of this is an expression of semeiosis, which provides the formal aspect of causation by which transmission of forms from causes into effects becomes possible. Thus, symbols are living signs capable of gathering information during perception and of conveying it to its interpretants as to produce general habits of conduct.

The conclusion is that the flow of causation that we perceive in reality is the predicate of every true proposition; and any living species is analogous to a true proposition as much as it is attuned to the flow of causation that grounds the real and allows its permanence.

Protosemiotics: signs without objects

Alexei A. Sharov

National Institute on Aging, Baltimore, USA

Semiosis is not limited to humans and higher animals but can be also found is all living beings including most primitive ones, such as bacteria and viruses. Thus, all life is inseparable from semiosis (Sharov 1992). Non-living natural objects are not semiotic because they don’t possess goal-directed behavior, although some of them can persist in meta-stable non-equilibrium states. The origin of life demarcates the emergence of evolvable goal-directed functional behaviors. And since these behaviors have to be encoded and controlled by signs to persist, they cannot exist without semiosis (Sharov 2009).

However, semiosis in primitive agents (protoagents) is very different from the advanced semiosis in animals and humans because primitive signs (protosigns) do not represent objects. Instead, they directly encode and control cellular functions. This primitive type of semiosis I call “protosemiosis” following Prodi (1988). Proto-agents do not have a capacity to recognize and classify objects, and thus, signs do not stand for objects and goals. Despite of that, objects and goals in protosemiosis can be reconstructed by human observers; hence, I call them “imaginable” or “imaginary”. For example, a triplet of nucleotides in mRNA does not stand for amino acid within a cell because cells have no representation of aminoacids as objects. However, humans can build a genetic code table that predicts reliably the composition of proteins. Protosigns can be classified into protoicons that signal via specific binding and/or catalysis, protoindexes that signal via physical association of several binding and catalytic domains, protosymbols that are processed by a universal subagent equipped with a set of heritable adapters, and protomessages that integrate multiple protosymbols into larger functional blocks (Sharov 2010).

Prefix “proto” is used here to characterize signs at the protosemiotic level and distinguish them from higher level icons, indexes, symbols, and messages. Besides the immediate response of interacting cell components, protosigns also evoke remote signification mediated by other signs and interlocked via logical gates. The cell regulatory network is characterized by stability, excitability, redundancy, and robustness. Molecular memory evolved from primitive autocatalytic feedback to pattern copying, proof-reading, editable and rewritable patterns (e.g., in epigenetic marks), and finally, adaptive learning. These mechanisms are prerequisites for the emergence of minimal mind which is a tool for classification and modeling of objects. The emergence of mind marks the transition from protosemiosis to eusemiosis.

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Underground encounters: mutual benefits of mycorrhizal partners

Slavíková R.[1,2,3] Půschel D.[1,2], Gryndlerová H.[1,2], Markoš A. [3], Jansa J.[1,2]

[1] Laboratory of Fungal Biology, Institute of Microbiology, Academy of Science of the Czech Republic, Vídeňská 1083, 142 20, Prague 4, CZ
[2] Department of Mycorrhizal Symbioses, Institute of Botany Academy of Science of the Czech Republic, Lesni 322, 252 43 Průhonice, CZ
[3] Department of Philosophy and History of Science, Charles University in Prague, Faculty of Science, Viničná 7, 128 43 Praha 2, CZ

In general, thinking about a plant without its fungal symbionts in roots is artificial and unnatural. Normal situation is a plant with the roots being transformed to so called mycorrhizas, i.e. complex organs composed of plant and fungal tissues where exchanges of mineral nutrients and carbon take place between unrelated organisms living in intimate relationship. Non-mycorrhizal mode of living is thus an exception in plant world. The original and still the most abundant interaction of this kind, arbuscular mycorrhizal (AM) symbiosis, is an integral part of the majority of world ecosystems, including extreme ones, such as sand dunes or aquatic environment.

An important aspect of this symbiosis is low specificity of interaction, leading to several different plants being interconnected by the same fungal hyphae. This ubiquitous networking of plant roots mediated by the fungal mycelia reaches a great complexity under natural conditions and, in most cases, is considered to be mutualistic. This means that the benefits to both partners outweigh their own costs. More specifically, the carbon invested by the plant to the fungus returns more benefits in terms of improved nutrient (especially P) acquisition from soil than building up extensive root system to fulfill the same function. In return, exclusive access to plant carbon (C) for the mycosymbiont is obviously worth providing the plants with mineral nutrients. However, there are cases where the fungus can be regarded as a parasite rather than a mutualist – e.g., when the symbiosis results in decrease of plant biomass as compared to non-mycorrhizal plants. Interestingly, it has been found that despite relatively high costs in sense of photosynthetic C consumption, plants do not withdraw completely from the interaction with low quality fungal partners. Such findings may imply existence of certain functional complementarity between AM fungi, which could actually stabilize such a multisided interaction over evolutionary timescales..

Tracing a defined fraction of plant C resources can help to elucidate the plant strategy in carbon distribution as well as the importance of functional diversity between various AM fungi to fulfill certain ecosystem functions. Recent research has shown that AM raises plant photosynthetic rates, thus actually keeping the symbiosis nearly C-neutral. Using 13C stable isotope labeling we ask if AM symbiosis also increases the rhizosphere respiratory rates, accelerating carbon turn-over in the ecosystems. We are also interested in the disentangling C allocation patterns between photosynthetic tissues and rhizosphere in AM plants as compared to their non-mycorrhizal counterparts.

Medicago truncatula was grown in pots inoculated with a single AM fungal isolate Rhizophagus irregulare. Eight weeks old mycorrhizal and control plants of comparable biomass were exposed to atmosphere enriched in 13CO2 over a 2 hour labeling period. Two levels of light intensity were applied during the labeling and over the following days, we carried out respiration measurements on the rhizosphere. Finally, the IRMS (Isotope Ratio Mass Spectrometry) analyses of 13C in plant, soil and respired CO2 will allow us to quantify the carbon fluxes in this experimental system.

The organic memory concept in 19th-century biology and its implications for current biological thinking

Švorcová, J

Department of Philosophy and History of Sciences
Charles University in Prague, Faculty of Science

The concept of organic memory, i.e., the analogy between heredity and memory, was particularly vivid in 19th-century biology, linked to Lamarckian philosophy (Hering 1870; Haeckel 1876; Butler 1910) and to the heredity of acquired characters. The concept also helped to explain how ontogeny recapitulates phylogeny, therefore even Haeckel himself introduced his organic memory concept. But the first scientist who explicitly attributed the faculty of memory to all organic matter (without involving consciousness) and provided a general definition of organic memory was the physiologist Ewald Hering. He believed that all traits of an organism, hereditary as well as acquired, are stored step-by-step in the organism and further distributed as memory traces available to future generations.

In my presentation, some basic aspects of organic memory concepts from the 19th century will be presented. The organic memory ideas at that time floundered between vitalistic (Butler 1910) and rather materialistic or mechanistic conceptions (Haeckel 1876). The former attributed some psychological features to cells or memory particles; the latter were based on physics or in Cartesian doctrine, and described memory as essentially localized as a kind of storage of traces or patterns of physical waves. The concepts were generally rather vague in terms of the concrete definition of traits inheritance.

In my presentation I would like to argue that the term memory is not a mere synonym for the term heredity (as in the neo-Darwinian tradition) and has its own semantic field in current science. I will further argue that in the light of current knowledge about hereditary processes other than genetic inheritance, the organic memory concept gains value and relevance in current biological thinking again. And that especially when interconnected with so called organic selection (Hoffmeyer & Kull 2003), with the inheritance of acquired epigenetic variation (Jablonka & Lamb 1989) and examples of developmental plasticity.

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Haeckel, E. (1876). *Perigenesis der Plastidule oder die Wellenzeugung der Lebenstheilchen*. Reimer, Berlin

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poster presentation

Genome semiotic modelling

Targon, V.

Queen Mary University of London

Analyzing the genome, its structure and functions provides a deep understanding of life processes. However, the complexity posed by the genome is enormous and has involved powerful instrumentation and computer programs, while a neglected approach has been to let the genome speak for itself.

Since its discovery, researchers pointed out an analogy between DNA and language. Formal language theories have been applied to biological sequences from two main fields: computational linguistics and generative linguistics. Markov models have been used to predict statistical features of the DNA, like word frequencies (Brendel *et al.* 1986), and to perform segmentation of the DNA into homogeneous segments (Churchill 1989). Generative grammars have been proposed as models of biological phenomena such as gene regulation (Collado-Vides 1989) and gene structure and expression (Searls 1988). Semiotics suggests a new perspective for analyzing the genome, i.e. semiotic modelling, that we explore. Semiotic modelling (Rieger 2002) is an iterative and cumulative process in structural linguistics, based on hypothetical representations and consisting of two stages: (i) *syntagmatic analysis* works on linear aggregations of signs, while (ii) *paradigmatic analysis* makes associations of signs based on selective replacement. By applying semiotic modelling to biological sequences, signs are identified in an unsupervised way in the forms of *syntagms* and *paradigms*, holding as meaning representations for the sequences considered. We compare these representations with state-of-the-art knowledge about biological processes.

A first application considers linear sequences of amino acids, as retrieved from a database of proteins or from a genome, in which coding regions have been translated into amino acid sequences according to the genetic code. The alphabet of such a corpus comprises 20 amino acids and 3 termination codons. First, we obtain syntagmatic constraints on the linear aggregation of the base symbols or amino acids. Then, by applying a measure of correlation and similarity, we cluster amino acids into groups expressing paradigmatic constraints of their usage. Groupings of amino acids obtained through semiotic modelling are compared with predefined knowledge representations offered by either (i) chemical classifications of amino acids, or (ii) amino acids usage correlation in protein classes (Karlin, Bucher 1992). Without requiring this external knowledge, semiotic modelling independently retrieves a grammar for the DNA, i.e. rules by which amino acids are organized into genes.

Then, we directly apply semiotic modelling to DNA without the interpretation offered by the genetic code. Base symbols are the 4 nucleotides: adenine (A), cytosine (C), guanine (G), and thymine (T). The expected output of semiotic modelling is twofold. Firstly, by focusing on coding regions and parsing them, it is possible to “rediscover” the genetic code. Secondly, it permits the interpretation of non-coding regions. However, in this case, traditional techniques for the syntagmatic analysis of texts are of limited applicability due to the fact that we also need to characterize long-distance correlations.

Brendel, V., Beckmann, J.S. & **Trifonov, E.N.** (1986). Linguistics of nucleotide: sequences, morphology and comparison of vocabularies. *Journal of Biomolecular Structure & Dynamics* 4(1), 11-21.

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Searls, D.B. (1988). Representing genetic information with formal grammars. *Proceedings of the 7th National Conference on Artificial Intelligence*, American Association for Artificial Intelligence, 386-391.

Rieger, B.B. (2002). Semiotic cognitive information processing: Learning to understand discourse. A systemic model of meaning constitution. In: R. Kühn, Menzel, R., Menzel, W., Ratsch, U., Richter, M.M. & Stamatescu, I.O. (eds). *Perspectives on adaptivity and learning,* Springer, Berlin. pp. 347-403.

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Uexküll in translation: ”Darwin and the english morality”

Tønnessen, Morten[1] and Beever, Jonathan[2]

[1] Department of Health Studies, University of Stavanger (Norway)
[2] Department of Philosophy and Weldon School of Biomedical Engineering, Purdue University (USA)

This presentation will include excerpts from “Darwin and the English Morality”, an English translation of an essay written by Jakob von Uexküll and published in its original form as “Darwin und die englische Moral“ in 1917 (*Deutsche Rundschau* 173: 215-242). The English translation, which has been conducted by Morten Tønnessen supported by English language editing by Jonathan Beever, is forthcoming in *Biosemiotics* along with a framing essay entitled ““Darwin und die englische Moral”: The Moral Consequences of Uexküll’s Umwelt Theory”, co-authored by Jonathan Beever and Morten Tønnessen.

Uexküll’s essay concerns the relation between German and English morality, framed by an application of his biological theory to the human cultural context. Uexküll’s 1917 critique of what he calls the “English morality”, written during World War I, points the contemporary reader toward important implications of the translation of descriptive scientific models to normative ethical theories. A key figure motivating biosemiotics, Uexküll presents here a darker side: one where his Umwelt theory seems to motivate a bio-cultural hierarchy of value and worth, where some human beings are worth more than others precisely because of the constraints of their Umwelten. The first English translation of this essay gives scholars access to Uexküll’s lines of thought, historical context, and normative interpretations. It is particularly pertinent for contemporary attempts to develop a biosemiotic ethics based, among other things, on the Umwelt theory.

Uexküll’s critique of Darwin refers to the latter’s treatment of the origin of morality in *The Descent of Man, and Selection in Relation to Sex* (1871). “The source of morality”, writes Uexküll, “is, according to *Darwin*, precisely this feeling of sympathy, in its relation to the susceptibility for praise and blame, which initially extends only to members of one’s own tribe, then in time, after the merger of different tribes to a people, to all fellow countrymen.” He cites Darwin’s words: “Sympathy beyond the confines of man, that is, humanity to the lower animals, seems to be one of the latest moral acquisitions”. In a central passage, Uexküll then observes:

> *It is not, as Darwin holds, an artificial barrier that is an impediment to the extension of moral consideration to all peoples and to the lower animals. Rather, the ethics that is founded on praise and blame is itself the barrier for the extension to fellow creatures whose praise and criticism one neither hears nor takes any note of.*

Modeling biosemiosis – Two concepts of Sign

Vehkavaara, Tommi

University of Tampere, School of Social Sciences and Humanities

In biosemiotics various biological processes and phenomena – from biochemical to evolutionary levels – are described as possessing some semiotic character. Often this is indicated by using concepts and terminology (sign, meaning, purpose, intentionality, agency, mind,…) that are more familiar when they refer to human mental phenomena. Modern science has for good reasons strived to get rid of such anthropomorphisms because of the anthropomorphic errors that easily follow. If we want that biosemiotics would be taken as a scientifically serious approach, we need to be extra careful in defining our concepts without committing to such errors.

Besides anthropomorphic errors, another problem may be that the biosemiotic concepts are used so vaguely so that no operationalization of them is possible. Especially the term "semiosis" is commonly attributed to various presumably biosemiotic cases without any specification about which kind of sign is in process and how the concept is applied in the case. Without such specifications it is not clear, for instance, how the semiotic consequences of the sign in case relate to its non-semiotic effects. However, there have been several attempts – at least from 1991 on – to specify the sign or sign-process in biological phenomena starting from more or less Peircean inspired ideas (or at least terms), but there are more pitfalls that we have been prone to fall on. When developing semiotic models to biosemiotic cases we should take care that:

1. the used semiotic concepts are carefully derived and adjusted to the case,
2. we do not merely decorate the standard biological description with epiphenomenal topping,
3. the elements of the sign under transformation or interpretation are detectable, differentiable, or identifiable for the biosemiotic agent in case (and not only for us), and
4. all the elements of the sign are necessary in the description of the phenomena, i.e. that they are irreducible.

I will shortly present some such attempts (Hoffmeyer & Emmeche, 1991; Sharov, 1998; Vehkavaara, 1998; Hoffmeyer, 1998; Queiros, Emmeche & El-Hani, 2006). Although everyone of these can be criticized as being unsatisfactory in some respects, it is important that more attempts (hopefully better and better) are made. Biosemiotic modeling appears as more demanding task than it may look in the surface. I will examine more closely Thomas Short's (2007) supposedly general conception of sign-interpretation and his biosemiotic application of it (a hungry bear tearing up logs and eating grubs exposed). In Short's example we will see that there are in fact two different kinds of signs involved together, a cognitive sign (with the concept of object) and a more primitive action guiding sign that has no proper object for the semiotic agent.

The "Biosemiotic perspectives in linguistics" project in its historical, present and future states

Velmezova, E.[1], Kull, K.[2] & Cowley, S.[3]

[1]*University of Lausanne,* [2]*University of Tartu & *[3]*University of Hertfordshire*

In his review "Twelve years with the Gatherings in Biosemiotics" published in the booklet of abstracts of the last Gatherings (Tartu, 2012), Don Favareau mentions very few linguists who participated in the Gatherings between 2001 and 2011. They are: Tuomo Jämsä (who participated already in the very first meeting in 2001 [p. 66]), Stephen Cowley (who joined the biosemiotic community in 2007 [p. 69]), (psycho)linguist Joanna Rączaszek-Leonardi (2008 [p. 70]), Natalia Abieva and Prisca Augustyn (2009 [p. 70]) and Angelo N. Recchia-Luciani (2010 [p. 71]). Even if the choice of designations ("linguists"? "philologists"? "philosophers [of language]"?) can sometimes alter the interpretation of facts (*odiosa nomina sunt*), this rather insignificant rate of *linguists* interested in biosemiotics provoked not only the question about the possible reasons of this state of affairs, but also a wish to contribute to the improvement of this situation.

This is how the project of the volume "Biosemiotic perspectives in linguistics" was launched in 2012, with the intention to publish it in Switzerland in 2013. The *general idea* of the volume was to present new methods, directions and perspectives of studying language and languages within the framework of biosemiotic models, or of studying language and languages simply with an interest in biosemiotics. In particular, the (potential) contributors to the volume were invited to answer the following questions:

– What can biosemiotics bring to linguistics (and vice versa)?
– What are the biosemiotic implications for language sciences?
– What are the biosemiotic groundings of language and how to study them?

How has the interdisciplinary union of linguistics and biosemiotics contributed to the reconsideration of some linguistic concepts? – such as *language* itself, *language* as *langue(s)* and *langage, syntax, (linguistic) sign, dialect, text, discourse, code* etc. Besides, articles on historical backgrounds and intellectual premises of biosemiotic approaches to the study of language and languages were also welcome.

The whole story of this project still goes on; nevertheless, some of the difficulties encountered allow us to ask once again the question about the reasons of this not so intensive cooperation of linguists with biosemioticians.

One of the major problems supposes a particular *definition of (human) language and its limits*, (implicitly) used by many modern linguists. Another source of difficulties seems to be a particular *interpretation of the main object of linguistic studies* ("language studied in and for itself"?) and the problem of (impenetrable) boundaries separating human and animal (among others) communication (cf. ["real"] *langue* vs *langage*). This situation can be partly explained by the existence of several schools and currents in linguistics: representatives of certain "linguistic traditions" seem to be much more open for the perception of biosemiotic ideas than others.

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"Enlivenment": A program for a first person ecology

Andreas Weber

Berlin

Wilson (2012) has called for a "second enlightenment" which reconsiders a basic dimension of freedom and meaning in nature. Wilson elaborates on the hypothesis that man is under constant tension between the needs of individual and group selection. Homo sapiens, argues Wilson, is biologically determined to freedom of choice. This determined indeterminacy, or so the argument, gives rise to culture and the realm of meaning in the human semiosphere. The plea for a "second enlightenment" thus takes this openness into the heart of biological thinking, hence breaking with the strongly deterministic notion of the "egoistic gene" and related concepts. In my presentation I want to argue that we should take this idea seriously, and that indeed there is already existing an underlying framework. This framework might be yielded by using the biosemiotic view of life-as meaning as a concept that can sketch a poetics extending from lived body to the human semiosphere. This approach could be called "enlivenment": To re-challenge "enlightenment" with a new approach means to put life-as-meaning center stage. A short program of "enlivenment" could built upon the following propositions:

1. Natural history is not the functional interaction of organic machinery, but the natural history of freedom, autonomy and agency.

2. Reality is alive: It is full of subjective experience and feeling; organic feeling is the prerequisite of any experience and of any rationality.

3. The biosphere is a material and semiotic interrelation of selves.

4. Embodied selves come to be only through others: The biosphere depends on cooperation and interbeing.

5. The biosphere is paradoxically cooperative: Its relationships are unfolding out of antagonistic, or incompatible processes: matter/form, code/soma, ego/other: incompatibility is needed to achieve life in the first place (Kull, 2012).

6. The individual can only exist if the whole exists and the whole can only exist if individuals are allowed to exist.

7. The experience of being alive, of being in full life, of being in the joy of full life is a fundamental component of reality: the desire for living / experience to become one’s own full self is a general rule of biological worldmaking, both interior/experiential and exterior/material.

8. Death is reality, it is inevitable and even necessary as the precondition to allow for the individual’s striving to keep intact and to grow. Death is an integral component of life.

9. The living process is open. Although there are general rules for embodied identity in interbeing – aka accomplished life–, its form and way is entirely subject to openness.

10. There is no neutral information, no general („scientific“) objectivity, but a common experiential level of understanding, interbeing and communion of a shared „conditio vitae“. New structures and levels of enlivenment can be made possible through living imagination.

From these structural observations, it seems possible to complete the existing ecological worldview (which is basically a technology of exterior material nature viewed as pool of resources) with an interior, or intentional aspect. To the scientific third-person-perspective of „objective reality“ we therefore have to add a "first-person-ecology". I argue for a supplement of the prevailing objective approach by the subjective perspective of embodied beings. I argue in favor of the introduction of unsolvable incompatibility – or paradox – into the description of reality (Glissand, 2002). We have to learn to experience and to describe the world as an inside again – but also to continue to treat it as an outside.

Glissant, E. (2002). The Poetics of the World: Global Thinking and Unforeseeable Events. Chancellor’s distinguished lecture, Louisiana State University, Baton Rouge, April, 19.

Kull, K. (2012): Introduction. Proceedings of the 13th Gatherings of Biosemiotics. Tartu University Press, Tartu.

Weber, A. (2013). Enlivenment. Towards a fundamental shift in the concepts of nature, culture and politics. Heinrich-Böll-Stiftung, Berlin. (forthcoming).

Wilson, E.O. (2012). The social conquest of earth. A biological history of man. Harvard University Press, Cambridge, Massachusetts.

RNA-Sociology from a Biocommunicative Perspective

Witzany, G

Telos–Philosophische Praxis, Buermoos, Austria

As no natural language speaks itself and no natural code codes itself there is a difficulty to explain codebiology without code-users. If the genetic code is really a natural code, there must be agents that share a competence to follow semiotic rules to appropriately use the nucleotide alphabet to coherently generate sequence structures that function. If „the meaning of a word is its use“ (Ludwig Wittgenstein), then the active „users“ of the nucleic acid sequences take center stage of research. As we know today DNA represents a habitat of an abundance of RNA consortia that shortely after transcription get active.

According RNA editing, alternative splicing and epigenetic imprinting the original molecular syntax of DNA can be transcribed in a variety of ways that differ according contextual needs, such as environmental conditions, developmental stages, tissue-specifity.

Meanwhile it is clear that e.g., the human genome consists of 1,5 % genetic sequences that code for proteins which constitute our body. The remaing 98,5 % of 3 Billion base pairs of the human genome represent non-for-protein-coding RNAs (ncRNAs). These ncRNAs are now identified as complex networks of interacting and regulatory elements to coordinate gene functions according developmental stages including all epigenetic regulations.

Interestingly these RNA consortia interact in a module-like manner, that can be adapted to a variety of functions. Additionally the origin and evolution of such RNA consortia may differ from the later function for which they have been domesticated. This talk will demonstrate some behavioral motifs of RNA consortia.

One common structural feature of “words“ in protein sequences and human texts

Michaela Zemková

Department of Philosophy and History of Science
Charles University in Prague

The analogy between genetic and human texts is a frequently discussed topic. One can oppose that is not possible to compare these texts which differ fundamentally from each other on the level of the code. Moreover, “genetic text” (e.g. sequence of biological macromolecules such as nucleotides or amino acids) is just a simplified model of real world; it is a statistical consensus resulting from the process of sequenation. However, human texts also do not fully reflect real phonetic situation of speech. In both cases, we have thus a reductionist model of reality. So it would be probably better to rebuild traditional linguistic analogies dealing with texts only and compare real physical bodies of biological macromolecules and a speech (or a spoken language). One such exercise could be the comparison of well known alternation of consonants and vowels in human languages and similar alternation of polar and non-polar amino acids in amphipathic alpha-helices which have a substantial share in protein structures.

In human languages, the usage of possible combinations of consonants and vowels is limited by the pronounceability of combinations of phonemes. Similarly, oligopeptide composition of proteins is influenced by requirements of protein folding and stability. One special type of structure often present in proteins is amphipathic alpha-helices in which polar and non-polar amino acids alternate with the period 3.5 residues. (Not unlike human languages¬, where one can expect just a simple alternation where longer strings of single consonant/vowels are prevented.)

In our study we try to explore this natural structural similarity in specific alternations using linguistic-like techniques: The proteomes (full sets of proteins for selected organisms) were transformed into ranked sequences of n-grams (words of length n), including periodical amphipathic structures. Similarly, human texts were transformed into sequences of alternating consonants and vowels. Analysis of the vocabularies shows that in both types of texts (human languages and proteins) the alternating words are dominant or highly preferred. This model is, of course, simplified and cannot reflect real phonetic situation¬ but it is sufficient for our purpose which is just to show that there are natural constraints which produce specific types of alternation in both systems and thus demonstrate an analogy we expect.

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