Abstracts

Friday morning

Tommi Vehkavaara

From the motives and methods of biosemiotics to experiential existential naturalism

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In biosemiotics, the concepts like sign, meaning, interpretation, purpose, etc. are used or applied in the science of life. The use of some concepts from humanities, be it semiotics, hermeneutics, metaphysics of mind, or 'folk psychology', are extended to grasp the whole sphere of life (in earth). During the annual Gatherings in Biosemiotics meetings, biosemiotics seems to have been formed loosely bounded non-standard discourse somewhere between humanities and the natural science of biology. Even some collections of basic theses have been formed that most biosemioticians (me included) are tended to accept (at least as plausible hypotheses) despite the disagreements in terminological issues.

However, whether there be any progress in biosemiotics is questionable. I am afraid that if biosemiotics do not get rid of mere analogy and metaphor talk or 'cocktail party discourse', it will end up to some marginalized, dogmatic, and self-sufficient sect. In the long run (though they are necessary at the beginning), loose humanist analogies and vague statements tends to drive away other scientists who are looking some fuller view to the phenomena of life than the standard neo-Darwinist biology ever can offer. I have earlier (in 1st Gatherings, Vehkavaara 2002) tried to argue that in order to make real progress even possible, we should think more carefully what the meanings and the legitimate scopes of the biosemiotic concepts are. I suggested that originally mental concepts used in biosemiotics should be naturalized. The basic idea of this method of 'biosemiotic naturalism' is that biosemiotic concepts (as sign, meaning, interest, etc.) should be redefined or 'operationalized' so that they refer only to *objects* of our (i.e. human) external experience.

Seemingly, the method of biosemiotic naturalism has not gained much acceptance from my fellow biosemioticians. One reason for this might be in some *motives* for biosemiotics that consist in the idea that many environmental, psychopathological, and social problems are conceptually originated from the culturally dominating (quasi)-Cartesian dualism of body and soul. In order to overcome these problems, we should thus try to surpass or reunite the dualisms of matter and mind, natural and mental/semiotic, natural and cultural/political/human, or mechanical and telelogical. The standard biosemiotic solution seems to be to suggest some kind of 'experiential biology' or metaphysics of 'qualitative organicism' (Emmeche 2000, 2001) that does not seem to be in line with biosemiotic naturalism.

From the point of view of experiential biology (etc.), biosemiotic naturalism may seem to lead back to ice-cold physicalism and implicit Cartesianism.

I will argue that 1. this is misunderstanding. 2. Experiential biology does not redeem us from our implicit Cartesianism, but quite contrary, it more likely doubles it. It is humanism (and hermeneutics) that maintains Cartesian distinctions by distinguishing itself from nature and natural science. 3. Although we should naturalize at least the basic semiotic concepts in biosemiotic biology (or science), it does not lead to the metaphysical claim that mentalist concepts and their objects were not real. Our everyday life is deeply dependent on their

validity most of our necessary self-knowledge is mediated by our inner feelings, emotions, etc. 4. However, objects of our internal experience should not be given any special status in relation to objects of external experience that are intellectually or cognitively more controllable. Instead, it could be examined whether the biosemiotic naturalism could be applied in existential philosophy whether the initial dualism in experience, i.e. the difference between the thought (or planning) of act and the act itself, could be removed from the experiential structure of self-consciousness so that the thought about action and action itself could be assimilated if desired. Perhaps this existential project, if feasible, could produce a new concrete awareness about self as a living body (or as a lineage of living bodies?) and not as a non-material soul or mind *in* the body. This might make us able to free ourselves the pathological consequences of quasi-Cartesian thinking.
Perhaps even naturalism can be existentialism.

Ulrich Krohs

Why semiotic models may have explanatory power in biology – and why economic metaphors may not

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Since semiotic theories were originally intended to explain aspects of human communication, their use in biology is an extension of the intended range of application, literally a “meta – phor”. Does therefore the explanatory power of semiotic models in biology depend on proving the initial metaphor literally true (whatever that might mean)?
My example is the information model of molecular biology. I will compare it with other metaphors used in biology that are definitely not supposed to have explanatory power, and ask whether metaphoricity really is the point that makes the difference. Examples for non-explanatory metaphors can be found in the class of economic metaphors widely used in teaching as well as in biochemical labs: ATP is addressed as the “energy-currency” of the cell, Acetyl-Co-A as the “central stock” of C_2-residues, and the TCA-Cycle as the “distributor” for non-fatty carbonic acids and related compounds.
I will introduce a distiction between two sorts of models, both explaining different aspects of a given process. I will show that the explanatory power of a theory can be increased by supplementation of a given model with a second one *only* if both are of different sort, and if two-model-descriptions can be proved adequate for the field in question. (The latter can be done for biology and for technical disciplines, but not for physics.) Economic and physicalistic models are of the same sort, as I will explain. Physicalistic models are involved in biochemical explanations anyway. Consequently, no increase in explanatory power can be obtained by the use of an economic metaphor. Semiotic and physicalistic models, on the other hand, are of different sort. Therefore, a physicalistic and a semiotic model may explain different aspects of a process. The deletion of the information model would decrease the explanatory power of molecular biology, be it metaphorical or not.

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Edwina Taborsky

The Interface as the Key Nodal Site of a Dynamic Semiosis

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Using the Peircean categories, I define the semiotic architecture as made up of six relations or predicates. These relations measure 'matter' in spatial and temporal variables. As measured, matter, in any form, is a Sign.
The Sign, as an organized measurement of matter (whether material or conceptual) exists as a relatively discrete unit of information - but - its existence is operative only within relations. It has both internal and external relations. The key relation is that of the Interface, the relation that mediates and connects internal organization and external organization.

The interface relation moves potential interactions, which are strictly internal, into actual interpretations. I examine six types of interface interactions and discuss how they operate within simple to complex systems.

Myrdene Anderson

The who, what, when, where, why, and how of "violence"

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"Violence", as any other notion, must be regarded first of all as a category accreting meaning in a particular linguistic, sociocultural, and historical context. The issue tackled here is manifold,
but largely leaves aside the emic/etic distinctions appropriate to cultural settings, which would revolve around the question of culture-bound (emic) and culture-free (etic) formulations. Rather, with respect
to living things generally, I ask about who, what, and which settings might be assessed as "violent", and how and why. Can one untangle at all the relations of deep-time biological and historical cultural habits, vis-a-vis situations, motivations, accidents, and cascades of the moment? What distinguishes the adjective "violent" from the noun "violence", and can investigating other languacultures' semantic categories be productive of insights? Indeed, can alloanimals be violent? What of plants! Some of these issues arise in the 2004 edited collection, Cultural Shaping of Violence: Victimization, Escalation, Response (Purdue University Press).

Morten Tønnessen

Notes towards a natural history of the phenomenal world

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According to the Umwelt ontology, an ontological subject is someone for which something appears. Through semiotic agency, all living beings are subjects of the phenomenal world. If so, then the first sign of life on Earth also marks the first known appearance of the phenomenal world. Furthermore, if the phenomenal world is the phenomenal counterpart of the biosphere, then one can assume that the historical development of the phenomenal world at some level parallels that of the biosphere.

What are the characteristics of the present ecological crisis, that distinguishes it from past events of ontological crisis? What are the dynamics of the phenomenal world? What are the long-term effects of a sudden loss of biodiversity, on the way of the world?

Georg Töpfer

The concept of sign and the concept of function: similarities and differences

The aim of my presentation is to give a general comparison of the concepts of function and sign in biology. I will discuss their epistemic status and value for defining and explaining biological systems. As Claus Emmeche has indicated, both concepts are closely related and can be interpreted to imply each other. One of their similarities is that both signify a triadic relationship between objects and are opposed to a mechanistic and reductionist approach. But, there are important differences as well. A striking difference is that the talk of function can be easily embedded in a causal description. As I will show, functions can be seen as a special kind of effect; so, causal processes can be functional or non-functional. The integration of the functional perspective in the causal framework has caused much trouble in the past but it is now controversial only in detail. In contrast to the causal background for the understanding of functions, sign processes are often conceived as non-causal, interpretative, and having their central domain of application in human communication. But what is the exact relationship between a causal-functional description and a semiotic description of a process? Is the integration of the sign-concept into the causal account possible? Is it useful? Or does the advantage of the sign-concept consist in giving an alternative to a causal understanding? Or does just this lead to the advantage of the function-concept over the sign-concept for an application in biology?

Toshiyuki Nakajima

Internal entropy and Survivability of Living Systems

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Oral + Poster

Because living systems (entities) require a predictable and ordered environment for survival the uncertainty of events occurring in life is a serious problem. Cells and organisms act against given situations in a selective and discriminative way to establish particular environment relationships. As a result, events occur in a relatively predictable way, because the relationships maintained restrict, in particular ways, the events experienced to a relatively narrow range of multiplicity. In other words, the environment they see does not behave randomly in so far as they act properly. Such an ordered environment makes a living system survive better. This paper introduces the internal entropy concept as a measure of disorder of the environment an actor experiences. The concept measures the uncertainty of events occurring to a system (actor) after taking a particular action, where events are cognized by an internal participant (i.e. focal living system) in a larger system, not by an external observer. In this sense, it may be called the entropy of Umwelt. The actions produce a set of events occurring to the actor with a particular probability distribution. The internal entropy does not necessarily increase with time; it may decrease with time. A value-weighted measure of the action-formed environment by considering meanings of events to the actor is also discussed.

Andres Luure

Functions and roles in biosemiotics

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A general semiotic framework is introduced, generalizing the concepts of signification and denotation. In this framework, a distinction is made between functions and roles in biology and they are semiotically interpreted.

Friday afternoon

Torsten Rüting

Uexküll's Cryptosemiotic Biology - Ethics for Investigators of Life

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Jakob von Uexküll (1864-1944) developed a theory of biology, which decisively contradicted the mainstream of biological thought in the 20th century. I point out, that Uexküll's agenda was fundamentally inspired by ethical concerns about the responsibility of science and scientists and that this concern was explicitly pursued and transmitted into medicine and psychology by Thure von Uexküll, who elucidated the semiotic character of his father's approach.

Uexküll's concepts, summarized in his *Theoretische Biologie* (1920, 1928), aimed at the re-consideration of the autonomous activity of the organism as the hub for the life-sciences. Congruently biology should interface the epistemics of the scientist and make him aware of his own activity as an interpreting organism – as a responsible subject integrated in functional cycles (Funktionskreise) that include his scientific objects. Claiming "objectivity" by pretending isolation from this unity would, according to Uexküll, deprive the investigator from recognizing the significance of the living process - leave him irresponsible, his results

without vital meaning -inapt or harmful to the knowledge of life. This refutation of the dogma of "objectivity" tried to instigate biology as *Umweltforschung* with an essential status in the ethics of responsibility for scientists and their audience. At the same time Uexküll refuted the claim that causality was sufficient to explain life-processes and offered an expansion of scientific thought and scope. He developed a "cryptosemiotic" framework to depict "creative natures process of creation". The ethic stance of his fathers biology was communicated to Thure von Uexküll, who transferred it into his medical practice and became nestor of psychosomatic medicine in Germany, a medicine in constant struggle with the established theory and system.
Outside the scope of science and medicine the Uexküll's, in their essay *The Eternal Question* (1944), use the Platonic dialogue *The Meno* to show the significance of results of *Umweltforschung* in arguments about ethics, morals and meaning of life. Later when environmental problems had begun haunting European thought, Thure von Uexküll's clarification of the semiotic character of his fathers writings was to show how the concept of biology as Umweltforschung could make biology a meaningful (bedeutungsvoll) science, which could serve as a unifying paradigm for other sciences, like medicine, psychology, economy, ecology and sociology. By reissuing the quest for an alternative to reductionism and it's disastrous consequences on health and the environment, Uexküll's work showed it's ethical concern and epistemological means for the recognition of the sense and significance of responsible investigation.

Han-liang Chang: The 'Philological Understanding' of Jakob von Uexkull

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The term 'philological understanding," a catch phrase once appropriated to describe the humanistic knowledge of Ernst Cassirer, aptly summaries the theory and practice of traditional hermeneutics until it was dethroned by modern philosophical hermeneutics represented by Heidegger and Gadamer. Cassirer's colleague Jakob von Uexkull, though an accomplished theoretical biologist who has been hailed unanimously as the founder of biosemiotics, was a scholar well versed in classical texts, not short of the image of humanist. His celebrated essay on "*Bedeutungslehre*" is initially mediated by the dramatic reenactment of a Socratic trial scene and his representation of the famous vitalist-mechanist debate echoes the Battle of the Giants in Plato's dialogue *The Sophist*. Jakob had authored an obscure dialogue which parodies Plato's dialogue *The Meno*, he left it unfinished, but his son Thure completed the text after consultation with Uexkull the Elder. The text has received very little critical attention, neither by biologists nor by semioticians. This paper aims to offer a parallel reading of the Platonic dialogue and its Uexkullian variation in order to see how Uexkull's favoured analogy between biology and geometry could have been inspired by Plato, and how his identity as a textual hermeneutician needs critical reappraisal.

Jui-Pi Chien

Baron Uexküll's French Connections--Georges Canguilhem, etc

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Some of you may have noticed that Uexküll makes more sense to the French structuralists than to his contemporaries. The diverse receptions of Uexküll reveal at least two trajectories of development before the late professor Thomas A. Sebeok crowns him as a semiotician in the 1970s: the one summarized by Kurt Goldstein from a neurological and organismic perspective in his *Der Aufbau des Organismus* (1934), which was dropped on its native soil but carried on by Daniel Lagache and Georges Canguilhem during the interval of World War II; the other accepted with reservation by Ernst Cassirer from an anthropological point of view.
Their discussions of Uexküll epitomize the dramatic change of the definitions of biology and epistemology. For Cassirer, biology is an ambiguous discipline, which is more identical with ethology that observes the practical needs of the lower animals, including the apes. Even though Cassirer pays tribute to Uexküll's concept of the *Umwelt* from time to time, he is resistant to incorporate *Umwelt* into his enterprise of the symbolic forms. Uexküll, in the history of philosophy delineated by Cassirer, is no more than an ideal morphologist who follows Cuvier and Goethe. In a quite different context, when Canguilhem collaborates with Lagache and Bachelard in rationalizing the pathological and the discontinuous in the history of life sciences, he recognizes in Uexküll a glorious turning point, which reverses the long tradition of using the celestial, the earthly, and the mechanistic powers to define the activities of living beings. For Canguilhem, biology finds its genuine loci in the cellular and the intracellular activities, whose interest is not simply to form but to spread out without losing their original meanings.
Uexküll makes sense to Canguilhem in the way that he equates both the human beings and the animals as active subjects in configuring their *milieux*. Nevertheless, this point of view was much in controversy when Uexkull's contemporary scientists still followed mechanism, dynamism, and behaviorism in a quantitative sense. This paper attempts to re-examine Uexküll's *Streifzüge durch die Umwelten von Tieren und Menschen* (1934), which is not just a pleasant comic book as its 1957 English translation propagates, but, as Uexküll himself proclaims in his preface, a polemical work against his contemporary scientists. I am going to argue that Uexküll foresees the study of "model organisms" and their qualitative changes, which are equivalent to both the animals and the human beings. A side issue in this paper is to question if we still string Uexküll along with Peirce and Morris, under the condition that Baron Uexküll's nourishing ideas have been smuggled and fabricated anew by Canguilhem's disciples.

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Russian biosemiotic school is represented by several independent groups and researchers. These researchers work both in Russia (Moscow, St.-Petersburg, Novosibirsk, Samara), and outside its boundaries (USA, Israel, France, etc.). The roots of Russian biosemiotics begin in the philosophy of the Silver Age (inherited centuries-old traditions of Russian spirituality), Russian structuralism and formalism of 1910-30, genetics and antidarvinism of first third of 20th century, transcending up to 1970 as A.A.Ljubischev school. Before the reception of popularity of F.S.Rothschild's works (1962), Ju.S.Stepanov (1971) was considered as the author of the term "biosemiotics". The interest in biosemiotics was stimulated by H.Patty's works, that resulted in the organisation (S.V.Chebanov, K.Kull, A.P.Levich, Ju.M.Lotman)

of the gathering "Biology and linguistics" in 1978 in Tartu. It was the first conference on biosemiotics in the world. During of the end of the 1980's and beginning of the 1990 the development of semiotics in Russian was promoted by the work of A.A.Sharov's seminar and two schools on biosemiotics, organazed by him. In the 1990's the basic centre of biosemiotic works in Russia became St.-Petersburg Seminar on biohermeneutics.

Mads Vestergaard: Life, difference and biosemiotics

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In the beginning of the nineteenth century the French philosopher and biologist Henri Bergson made a theory of life which at the time became very influential. Subsequently, however, his theory was ignored by the next generations of philosophers. That this was a mistake if the phenomenon of life is to be comprehended is what I argue in this paper. Bergson criticizes both the Darwinian and the Larmackian theory of evolution for not being able to deliver a consistent answer to how the evolution of life works. What they lack is a concept like the Bergsonian élan vital – a spontaneous "lifeforce" bringing about ever new forms of the living – which is able to avoid both the idealistic reduction of matter to mind and the materialistic reduction of mind to matter; a concept allowing for the
possibility of organic freedom, subjectivity and the fact that both freedom and subjectivity are realized in matter. According to G. Deleuze the core of élan vital is that life is the process of creating differences, a process of differentiation. This claim becomes very interesting when compared to the biosemiotic claim that life is processes and evolution of semiosis. The possible connection between these two claims is what I develop in my paper.

Kalevi Kull

Biology of Sympathy

Andreas Weber

Molecular intentionality: Robust embryological networks and "autonomous agents"

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"Cousins to the ameba that we are, how could we know for certain?"
- Donald T. Campbell

In my paper I want to bring together recent genomics research with the core idea of the self-constructive living process or "autonomous agent" to formulate a minimal model of biosemiotics in action. My aim is to take particular fresh results from genomics research and modelling to demonstrate that the biosemiotic paradigm is more apt to explain their intricacies than the current genetic doctrine is. My text will apply the idea of "genetic scaffolding" (Hoffmeyer) to analyse the minimal requirements of a biosemiotic agent. Experiments (von Dassow et al., 2000; Kulesa et al., 2000) show increasing evidence for much more

independence between developmental processes and genes. In simulations, ontogenic growth centers manifested experimental stability when "informed" by different sets of genetic instruction. Stronger still, there was no threshold at which "enough" quantitative tuning sufficed to make the system run: rather, it started running at a certain complexity threshold. (von Dassow et al., 2000). In my paper, I want to map biosemiotic concepts as "autonomy", "self/other", "intention" against these latest findings to explore the ground for an empirical working model of a biosemiotic reformulation of genomics.

João Queiroz[1,2] & Charbel Niño El-Hani[1]

On the emergence of semiosis: toward a multi-level hierarchical approach

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Any evolutionary story of how semiosis (*meaning process*) arose must be supported by a theoretical framework according to which it is logically possible to describe a transition from Secondness to Thirdness. Even though C.S.Peirce has established a rigorous distinction between these categories, including their formal boundaries in terms of irreducible classes of relations (EP 2.424; CP 1.293; W 5:242), he did not clearly describe the dynamics responsible for the emergence of semiosis in an evolutionary scenario.
Here we propose that the emergence of semiosis can be understood as resulting from fundamental interactions in a triadically organized hierarchical process. Following Salthe's (1985) basic triadic system, and in accordance to Peirce's theory of categories, we consider: (i) semiosis at a focal level, where we actually observe a given kind of meaning process we intend to explain; (ii) a micro-semiotic, lower level, which establishes the potentialities or initiating conditions for the emergent process at the focal level; and (iii) a macro-semiotic, higher level that establishes the boundary conditions that coordinate or regulate the dynamics at the focal level. Initiating and boundary conditions are interpreted as lower-level and higher-level constraints, respectively.
This approach leads us to tentatively explain the emergence of semiosis by considering following steps:(1) Each chain of triads is located at a focal level; (2) Focal-level semiosis is explained as emerging as a process at the focal level as a result from constraining conditions established by micto- and macro-semiotic processes. Micro-semiosis refers to relations of determination within each triad, which establishes the potentialities or initiating conditions for focal-level semiotic processes. Macro-semiosis concerns the embedment of chains of triads within a higher-level system of related chains, a network of chains of triads that establishes the boundary conditions for the focal-level semiosis

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Kaie Kotov

Media and the human Umwelt: Where does cultural semiotics stand?

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I will take a daring attempt to discuss methodological issues of cultural semiotics at the conference devoted entirely to biosemiotics. The point of departure for my presentation is the question, what kind of methodological challenges does biosemiotics (as well as its contingent disciplines) pose for the semiotics of culture.

The problematics of media – even in the framework of semiotics – is far too broad to cover in its entirety. As the etymology of the concept suggests, it is an in-between phenomenon. Thus, medium and/or mediation manifests itself at the core of the entire semiotic enterprise, being related to the fundamental concepts of sign-relation and boundary at the very basis of the semiosis. Also, the concept of medium can be expanded over the whole heterogeneous field of semiosis as it is manifest in the specific use of different types of media in signification and communication.

My reflections draw on three main sources: first, Gregory Bateson's „Ecology of Mind"; second, Yuri Lotman's theory of culture, and more specifically, his concept of semiosphere; third Jakob von
Uexküll's theory of Umwelt. It is common to all these approaches that they treat identity in terms of individual plus environment. They provide complementary models for the understanding of human-environment connections that make up this unit, which in a somewhat reificating terminology may be called an 'ego'. Secondly, they all consider organism(human)-environment relationship in terms of the cyclical process information transfer. Thus, in all these treatises, the process of mediation plays a crucial role. Third, in all these approaches it is more or less explicit that this kind of communicative system makes up the unit of evolution or – the unit of survival.

Uexküll does not provide lengthy discussions about the specific forms of mediation in the human Umwelt but he does provide a certain clue when saying that: „All our useful devices, our machines, only implement our acts. There are tools that help our senses, spectacles, telescopes, microphones, which we may call *perceptual tools*. There are also tools used to effect our purposes, the machines of our factories and of transportation, lathes and motor cars. These we may call effector tools" (Uexküll 1957 [1934]: 6). In the light of this small passage, Marshall McLuhan's notion of the media as the 'extensions of man' is not too far fetched. Even more so: in certain respects, these two accounts appear to be co-extensive as both authors consider the sensory-motoric structure of an organism (and its 'prostheses') as central to the constitution of the meaningful world.

Yuri Lotman's account of culture as semiosphere implicates two further statements: first of them pertains to the ontology of culture (the existence of an abstract sphere of texts, languages, ideas, value systems etc.) and the second to the methodology of the semiotics of culture (semiosphere as the unit of semiotic analysis). I will provide a brief account of the affinities and discontinuities between Lotman's conception of semiosphere and Gregory Bateson's conception of mind. Then I will outline briefly a research program for an understanding of anthroposemiosis in relation to its environment, based on the semiospheric approach (i.e. semiosphere as a model of cultural complexity). Semiosphere as the abstract sphere of ideas, languages, texts and value systems (i.e. semiosphere as an ontological category) however constitutes only one part of the total picture.

In this framework, the field of identity is embodied mind (rather than vice versa — minded body — which is the usual locus of identity and subjectivity in traditional western philosophy). As embodied mind encompasses a far larger space than that which is limited by

the skin (as exemplified by Gregory Bateson) it includes the ever-multiplying channels for the communication with the multiple environments constituted on the way.

General semiotics seeks to overcome the philosophically dubious and ethically problematic oppositions between culture and nature, mind and body, inside and outside, taking as a starting point Peirce's doctrine of signs and his stance that triadic sign relation is an explication of the formal structure of intelligence, which, in its turn, can be considered to be co-extensive with life. Peirce's notion of sign relation as a formal structure of life is of vital concern not only for biosemiotics but also for the semiotics of culture that, in its different manifestations, has so far largely neglected the methodological issues that rise from the assumption of contingency between the biosphere and the spheres of mental as well as material culture (latest developments in cultural anthropology seem to be in much closer connections with the epistemological framework provided by the general semiotic approach). I would argue, that from the methodological point of view it is necessary to make distinctions between different spheres of semiosis, even if they do not run along the customary disciplinary and/or ontological boundaries.

The heuristic distinction between semiosphere (the sphere of cultural textual communication), biosphere and noosphere is one way to account for the multiple forms of semiosis and types of informational pathways. Even if cultural semiotics is focusing primarily on semiosphre, it is a methodological necessity to establish the interfaces and overlaps between the different forms of semioses.

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COGNITUS PROJECT

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PETROBRAS built a pipeline in Western Amazonia to transport crude oil from the Urucu River production region to a terminal in the vicinities of Coari, a city located on the right margin of the Solimões River. Tankers then ship the oil to another terminal in Manaus, capital of the Amazonas State. Between dry and wet seasons, water level changes in the Solimões River reach up to 14 meters This strong seasonal character of the Amazonian climate gives rise to four distinct scenarios in the annual hydrologic cycle: low water, high water, receding water and rising water. These scenarios constitute the framework for the definition of oil spill response planning in the region, since flooded forest and flooded vegetation are the most sensitive fluvial environments to oil spills. The methodology currently used in Amazonia to assess environmental risk to oil spills includes image processing of remote sensing data and geographic information systems. These procedures are carried out in order to generate sensitivity index maps for fluvial regions of the Solimões river using land cover classes adapted by Petrobras for Western Amazonia from a methodology proposed by NOAA for coastal regions. These land cover classes include: (1) manmade structure, (2) exposed rocky platform or outcrop, (3) rapid / waterfall, (4) scarp / cliff, (5) exposed sand / gravel beach or bank, (6) sheltered sand / gravel beach or bank, (7) exposed mud beach or bank, (8) sheltered mud beach or bank, (9) confluence of rivers and lakes, (10a) aquatic vegetation bank (macrophytes), (10b) flooded vegetation. I is undeniable that this methodology has provided a great deal of information about oil spill environmental sensitivity in Western Amazonia.

However, this view is limited and ambiguous, if we attempt to fully understand the fluvial environment in Amazonia. Unfortunately, this approach is not robust enough to address the complexity of spatial and temporal patterns in the Solimões River alluvial plain. The river seasonal variation is represented by an intricate arrangement of channels that change with time. The hydrological cycle produces and wipes out huge patches of flooded forest. Such a landscape regulates the spatial distribution of flora and wildlife, as well as the social habits of riverside villages. This web of relations is progressive and evolutionary. A reductionist treatment is not possible. A wider approach to this problem is needed. This issue gave rise to the Cognitus project. It is a theoretical and empirical study of the Amazon complex system. From molecular to ecological and evolutionary scales, the project is conducted as interdisciplinary research. There is a deep interaction between Mathematics, Art, Philosophy, Semiotics, Computational Science, Evolutionary Robotics, Remote Sensing, Chemistry, Hydrology, Geology, Ecology, Botany, Genetics, Sociology, and Economics. These disciplines become partners in building up cognitive tools to identify esthetic and logical patterns in the Solimões river floodplain. Our group intends to establish an innovative theoretical framework for understanding the natural processes that occur in this complex region. We are starting from the hypothesis that esthetic perception, logic of relatives, and complexity theory must be used to understand these environmental relations in Western Amazonia. Such an approach will allow Petrobras to build up more sophisticated sensitivity index maps that will provide a solid base for designing thorough strategies to oil spill contingency plans in the region. The Company believes that Cognitus will contribute to increase the fundamental scientific knowledge regarding the complexity of the Solimões River alluvial plain. Such a project has great potential to yield radically innovative technology that will enhance Petrobra's commitment with social responsibility in Amazonian region of Brazil.

Saturday morning

Turovski A

The signs as arguments in dialogical network of animals associations

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The system of adaptational intercourse developments in animal associations could be semiotically approached as a network of dialogical proceedings in the context of the Semiosphere. In animals “dialogue” the participants/contestants are linked, intertwined, counterbalanced and most important of all – oriented onto each other on the ground of optimizing treatment of resources. Sign-system analysis could promote the understanding that conventional ‘users’ are in their turn very important resources for the classical ‘used ones’. Classical example – interactive complex ‘Siberian tiger-Goral-Red wolf’, as opposed to Grey wolf. It is disastrous for the pray-species (Goral) to be left without Tiger’s influence in the ecosystem just because the Red wolf by itself is not a match for the Grey wolf. The dynamics in this complex work almost entirely by the signs of territorial marking. Most spectacularly the diversity of signs fortifies the dialogical processes of semiosphere in cases of - a) well parasitised associations; b) well predatorised associations. And the most bright outputs we observe in the phenomenology of mimicry.
The estimation of how well is an animal association predatorised or parasitised has to be based on the level of specialization of parasites and predators (grade of hostility) and the

pressure of competition between hosts and pray species. This kind of estimation is semiotic process in real ecosystem.

Mette Böll

Social is emotional

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To be able to describe the interactions of social animals, I use traditional ethological methods within a biosemiotic framework. This allows me to take into account the evolution of mind and the emotional states of mind in the non-human animals in question, as sociality is based on emotionality. I suggest that all beings experience their lives (to some species-specific degree), and the essence of experience is an emotional state of mind. This emotional condition is independent of the questions of a possible conscious condition, and in their social interactions, the animals express their states of mind in specific behavioral expressions. Thus, it is possible to study these without submitting to anthropomorphism and biosemiotics expands and becomes a tool for practical field research.

Tobias Cheung

Merleau-Ponty and the Primacy of Perception

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In the 1930s, Merleau-Ponty tried to replace the mind-body-dualism through an orgamism-to-organism or man-to-man-interface. The constitutive moment of this interface is, according to Merleau-Ponty, “perception”. The order that “perception” establishes is different from the one that establishes “physical causality”. “Perception” is neither just a material impression nor just a cognitive expression. Rather, it intermediates between two perceptive entities. Merleau-Ponty decribes this intermediation as “an interpretation of stimuli” that results in a “certain configuration” in “organisms”. Further on, each perception “contains” an “open horizont” of “interpretations”. In the paper, I will reconstruct Merleau-Ponty’s concept of perception and situate it between the conflict line of human and natural sciences.

Stephen Pain

Ants in the Pants of the Cognitive Scientist: Biorhetorics and Ants

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In this paper I wish to analyse the behaviour and communication systems of one type of eusocial insects (ants) with the view to developing an argumentation system (biorhetorics) that can be used as the basis for a software programme to simulate the responses of ants to various stimuli. Another application of this argumentation system is as a paradigm for a sensory system component in an AI or robot cognitive system. The first part of the paper will be given over to a brief discussion of the semiotic, syntactic and semantic relations in

argumentation and general communication. Some of the paper will cover ancillary topics such as “swarming”, “optimum decision-making”, “saliency” and use of pheromones in modelling.

Dario Martinelli

A whale of a sonata. Organisation and form in zoomusicological structures.

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At the end of his essay *Among whales*, Dr. Roger Payne wonders about the existence of a “musical Platonism”, i.e., a great universal musical archetype constituting the basis for each animal musical culture. We do not have enough information to establish how ancient music is (human or not), but, says Payne, if it is *really* ancient, atavistic one might say, then maybe we would understand why we find so much emotional and intellectual significance in it, without knowing why. If such a basic aspect of our life as music is so indefinite and vague, possibly it is because its roots are much closer to the brain of our reptile ancestors than to that of *Homo sapiens*. Possibly music is something that precedes rather than follows language. In my research, I have tried to investigate the credibility of such an hypothesis. Cetaceans, humans, birds, canidae, insects and so on display an impressive reciprocal resemblance in their own musical behaviour, and this is already a start. Through the comparison between human and other animals’ musical experiences, many of these similarities have come out, allowing me to attempt a more pinpointed task, i.e., to focus my attention on all those elements that recent musical semiotics, although in a very heterogeneous way, has named “universals”, and compare them with zoomusicological issues. The question is, Are universals to be detected only at the anthropological level, or does the concept of universality go beyond the threshold of human music?

The present paper deals with zoomusicological applications of theories of musical universals. After a general introduction on the issue, the paper will focus on one particular case study, that of organisation and form in non-human musical structures. To deal with form and organisation in music principally means to accept the concept that music is a game of rules. Such rules may be universal, cultural or individual, but still they are rules. Many arise from conventions or habits within a given community; others derive from social and historical interaction; others, perhaps most of them, are related with instinctive and emotional causes. As Prof. François-Bernard Mâche, the founder of zoomusicology, underlines, "We must know in fact that, contrary to what is currently believed, man does not have the monopoly of hierarchies of pitches, intensities and durations”. In other words, a demand for "organising", controlling, measuring, pitching, etc. music is present in many species, each with its own characteristics and degrees of complexity.

Key-words: *universals, zoosemiotics, zoomusicology, musical structures, musical form*

Joao Queiroz, Ivan Araújo, Sidarta Ribeiro

The emergence of referential symbolic process in non-human primates: a semiotic analysis based on C.S.Peirce´s extended theory of sign

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The emergence of symbol-based semiosis as a benchmark of human's cognitive uniqueness is a widely accepted notion in several fields of academic knowledge. Against this view, we have recently demonstrated that non-humanprimates such as African vervet monkeys possess symbolic competence, as formally defined by Peirce (Queiroz & Ribeiro 2002). This competence can be attributed to eurobiological mechanisms that are common to associative processes found throughout the animal kingdom. Here we develop these results by showing that the equivocal role ascribed to symbols by 'folk semiotics' stems from an incomplete application of the Peircean logical framework for the classification of signs, which describes 3 kinds of symbols with increasing levels of generality: rheme, dicent and argument. We proceed to demonstrate that vervet monkeys commonly employ dicent symbols, but not arguments. This leads us to propose that the debate about the origins of human language should not focus on the emergence of symbols, but rather on the appearance of symbolic arguments.

Queiroz, J. & Ribeiro, S. 2002. The biological substrate of icons, indexes and symbols in animal communication: a neurosemiotic analysis of Vervet monkey alarm-calls, In: *The Peirce Seminar Papers – The State of the Art. Vol. V* (Ed.) M. Shapiro. Berghahn Books. pp. 69-78.

Sunday morning

Don Favareau

Making the differences that make a difference: The evolutionary and ontogenetic creation of iconicity

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"The shower of impulses coming in over the optic nerve surely contains no picture. The picture is to be developed, to be created, by the intertwining of all these neural messages … all this is neither objective truth nor is it all hallucination …somewhere between these two is a region where you are partly blown by the winds of reality and partly an artist creating a composite out of the inner and outer events." Gregory Bateson (1978:244-245).

Contemporary neurobiological research increasingly supports Bateson's intuition that sensory perception is intimately bound up with processes of bodily and environmental interaction in an ongoing perceptual constructivism that cuts across the sub-systemic distinctions of brain, body and world. In particular, convergent evidence from research on the neurobiology of vision offers strong support for Bateson's fundamental insight that "the elementary unit of information - is a difference which makes a difference" (2000/1972:459) and that the recursive interaction of such elementary differences within the central nervous system results in the emergence of increasingly fine-grained perceptual experience. Biosemiotically, this visual network of organizational relations is only to be expected, as the evolution of the eye itself rests upon the evolution of a cell which has, over eons of perception-action cycle interaction, become entrained to respond selectively to a range of photon configurations in the surrounding environment – a selectivity that ranges on the level of the single neuron from gross light wavelength discrimination of binary "light" and "dark"

to extremely fine-tuned perception of individual shapes, movement trajectories, faces, fingers, mouths and hands (e.g. Parret 1987, Hubel 1988, Rizzolatti 1996, Zeki 1999, Iacoboni 2001). The research showing that both individual neurons and the networks of which they are a part can be selectively "tuned" by evolutionary and by ontogenetic experience (i.e. – that they "take habits" in the Peircean sense) will be reviewed in the talk, and the argument will be presented that Bateson's elemental "difference" is coextensive with the Peircean notion of *iconicity* – the fundamental relation whereby the plenum of experience is carved into discrete entities by agents to become the relata from which all subsequent sign activity proceeds.

Peter Harries-Jones

Gregory Bateson, Abduction, and Ecosystem Communication

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Preliminaries: Bateson accorded with Peirce's idea that abduction is a means through which a relation between human understanding of itself and human understanding of nature can be investigated, as part-to-whole and whole-to- part. As with Bateson, Peirce's abduction takes place within a tense logic of constraints and consciousness, while changes in perception and perceptual judgement are largely unconscious. Thesis: If a recent reading of Peirce is correct (Merrell in *Sensing Corporeally*), there are distinctive approaches to their process of interpretation of what Peirce called 'firstness.' Peirce metaphysics holds to a non-conscious linkage of sign, semiotic object and interpretation occurring through resemblances, identities of form; for Bateson the same non-conscious linkages occur through a primary grasping difference that can only be interpreted through a learning process with others. Bateson rejected a metaphysical approach to mind and inevitably this also changes the way in which he 'borrowed' Peirce's concept of abduction. For Bateson, patterns of interaction in the outside world become recursively incorporated into our own perceptions so that with an increasing awareness or learning about 'patterns which connect,' processes of abduction engender integration of mind and nature. Explication: Bateson's 'outer' perspectives of non-localizable 'mind' based on the grasping of differences between differences is now established not only with regard to perception - the common interest of Peirce and Bateson - but also empirically, with pheromones in semiochemical studies, and leads to an ecosemiotics with a very wide domain.

Søren Brier

What is the pattern that connects? Bateson in Cybersemiotic perspective

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Bateson's idea that at materialistic science is not enough to understand what connects inanimate nature with living systems and mind has been crucial to modern attempts to understand what evolutionary pattern it is that connects matter, life and mind. To Bateson it was patterns of communication understood as recursive patterns of information feed back and feed forward in cybernetic systems in dynamical balances away from thermodynamic equilibrium. Bateson actually started to develop a semiotic theory for animal communication.

But it is the present authors theory that the further development of his theory was inhibited by his Weinerian cybernetic information science foundation, where the similarity between thermodynamic and informational entropy was seen as the resolving the mind-matter problem. Bateson's "ecological mind" stayed as a functionalistic cybernetic informational theory without ability to reproduce a model of signification including first person experiences and final causation. The development of autopoietic theory from Maturana and Varela to Luhmann has been a step forward in understanding signification and communication but is still limited by the lack of a theory of mind that includes first person experience and qualia to understand final causation and signification. Peircian biosemiotics delivers a framework that has these aspects inbuilt from the start. The Cybersemiotic development of this, including Bateson, Maturana, Varela and Luhmann's with biosemiotics, spells out the threefold causation model (efficient (physical), formal (informational) and final (semiotic)) and a theory of communication involving all three levels plus a general theory of levels placing the information level as a protosemiotic level.

Brier, S. (2002/2003): "Luhmann Semiotized", *Journal of Sociocybernetics*, Vol. 3, No. 2, 2002/2003, pp. 13-22.

Yair Neuman

Meaning Making in Living Systems

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Following Bateson, meaning-making involves the process by which a system responds to an indeterminate signal. This presentation focuses on meaning-making in living systems. It proposes several guidelines for studying the process of meaning-making in living systems in general, and in the immune system in particular. Drawing on a general framework for studying meaning-making in living systems, I suggest three basic organizing concepts for studying meaning-making. Those
concepts may shed new light on biological processes and present a radical alternative to the information-processing approach that governs biological research. Thus, my recent papers on the human immune system provide examples for a new understanding of "immunity."

Jesper Hoffmeyer

From Things to Relations

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The present 'turn towards the spiritual' has probably much to do with feelings of disturbance arising from the rapid increase - due to 'clever technology' - of our mastery of the more intimate and everyday aspects of life. This has created an acute sensitivity towards the huge lacunae leftover by rational knowledge and technology. From a Batesonian view, the roots of these lacunae are to be found in fundamental epistemological errors in the preferred schemes of conceptualizations in western culture - a dualism never decently surmounted, and a persistent reification of relation. Relations come in many kinds, but science invariably treats

relations as dependent variables, dependent that is on things. Expressed in Peircean terms what happens is that events belonging to Thirdness are reduced to Secondness,'brute force'. Bateson strived to grasp exactly that aspect of the world. While not allowing himself to implement the categorical metaphysics of the Peircean system directly into his thinking, Bateson gave primacy to process and relation over things. He implicitly cleared the way for a semiotic kind of final causation, which however he would perhaps not himself have accepted, because his understanding of final causation implied an inversed - and totally contra factual - temporal ordering. The very systemic characteristics he found in aesthetics in natural systems seems however to point the way to other possibilities for understanding final causation. Such possibilities can be made fruitful in a biosemiotic reframing of technological challenges as well as in our feelings of belonging in a big 'pattern that connects'.

Charbel Niño El-Hani[1] & Claus Emmeche[2]

A biosemiotic analysis of the gene concept

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The term ‘gene’ was proposed by the Danish geneticist W. L. Johannsen in 1909 and has certainly been one of the landmarks in the history of science in the 20th century. The advances of molecular biology in the 1950s and 1960s established the classical molecular gene concept, according to which a gene is a sequence of DNA that encodes a functional product, a polypeptide or a RNA. This concept is closely connected with the ‘central dogma of molecular biology’, conceived as a statement about the flow of ‘information’ in a cell. Thus, it faces the problem that there is no clear conception of ‘information’ in biological thought. In molecular biology, ‘information’ was simply identified with a substance, a string of DNA constituting a ‘gene’, even though the concept of ‘information’ is closer, as the very word suggests, to the concept of ‘form’ than to that of ‘substance’. The consequences of this problem go far beyond conceptual issues in molecular biology. In *Ontogeny of Information* (2nd Ed., 2000), Oyama argues that genetic determinism is inherent to the way we represent genes and their function in biological systems. In her view, as long as genes are represented as if they carried information about how an organism will develop, they will continue to be regarded as determining causes, no matter how much evidence against this idea exists. The problem may lie, however, in the way we understand what is ‘information’ in biological systems. But to clarify the concept of information, we should employ appropriate conceptual and methodological tools. Biosemiotics, up to the present a lacking perspective in current debates about the gene concept, can significantly contribute to a precise and coherent understanding of the notion of information in biology.
Instead of turning biological information into a substance and limiting it to DNA, biosemiotics helps us reformulate the notion of information in biology so as to convey a more dynamical concept of a shared program in which all cellular components function as instructions and data (Keller 2000). That the time is ripe for such a reformulation is shown by the polemics about the concepts of ‘gene’ and ‘genetic information’ in the last decade. Recently, Maynard Smith (2000) proposed a definition for ‘information’ in biology. The ensuing controversy (e.g., Sterelny 2000, Godfrey-Smith 2000, Sarkar 2000, Winnie, 2000, Griffiths 2001) clearly showed the absence of consensus among biologists and philosophers of biology about this central notion. As Griffiths (2001) sums up, ‘genetic information’ is a

metaphor in search of a theory. Biosemiotics can greatly contribute to the building of such theory. As regards the gene concept, several discoveries in molecular biology, including transposons, split genes, alternative splicing, consensus sequences, etc., eventually led to the dissolution of protein-coding genes (Fogle 2001). In the end of the 20th century, the 'gene' was a concept in crisis. Keller (2000) considers the gene a concept 'in trouble' and suggests that maybe the time was ripe to forge new words and leave that concept aside. Falk takes a more optimistic view: while admitting that the gene is a concept 'in tension' (Falk 2000), he seeks ways to 'save' it (Falk 2001). Hall (2001) is even more optimistic, arguing that, despite published obituaries, the gene is not dead, but alive and well, even though seeking a new home, which, in his view, is the cell as a fundamental unit of evo-devo. The attempts to save the gene led to distinctions between different concepts, as, e.g., Griffiths and Neumann-Held's (1999) distinction between the 'molecular gene' and the 'evolutionary' gene or Moss' (2001, 2003) discrimination of gene-P (the gene as a determinant of phenotypes or phenotypic differences) and gene-D (the gene as a developmental resource). A biosemiotic analysis provides another way of saving the gene concept, but only through considerable modification of its meaning, and in the end locates the gene in the cell as its natural home, as argued by Hall (2001).

Emmeche and Hoffmeyer (1991) proposed, as an alternative to the idea of information-as-a-piece-of-DNA, an understanding of biological information based on Bateson's (1972, 1979) notion of information as a difference that makes a difference to somebody. According to this definition, for something to be 'information', it is necessary 'someone' to make sense of it. It may seem at first that this concept applies only to humans, as it depends on the notion of 'someone'. But a biosemiotic view of living systems extends the reference potential of the term 'someone'. Peirce (1897) defined a 'sign' as "... something which stands for something to somebody in some respect or capacity". But 'somebody' should be conceived in the very general sense of an interpreter. In this sense, a transcription machinery synthesizing RNA from a string of DNA or a membrane receptor recognizing a given hormone can be regarded as interpreters.

A sign was conceived by Peirce as a triadic relation between 'a First', the Primary Sign or 'the Sign Vehicle', and 'a Second', its Object, 'determining a Third', its Interpretant. If we assume that a gene to 'contain' information has to make a difference to an interpreter, naturally conceived as the cell, it will follow that, if we want to keep the concept of 'genetic information', a gene should be conceptualized as a sign. But this means that the gene should be understood as a relationship between three elements, so that, on a Peircean interpretation, there's more to the gene than a piece of DNA. In the case of a gene encoding a protein, to be a sign the gene has to be interpreted as a triadic relation between a string of DNA as a Sign vehicle, and an Object, the protein, determining a third, its Interpretant. The (Dynamical) Interpretant is the effect of the gene on the cell, the interpreter of the gene as a sign. The Interpretant will be, therefore, the function or dysfunction of a given gene in a given cell. The biosemiotic analysis of the gene concept has intriguing consequences to the meaning of the gene. Let us briefly mention just two issues: (i) if a gene is interpreted as a sign, then two identical strings of DNA which result, for instance, in two different proteins in different cell types by alternative splicing will be regarded as two different genes, despite the identity of sequence, not as two tokens of the same gene (although differently expressed); (ii) as the concept of the gene as a sign includes a dynamical effect as part of its definition, the gene thus conceptualized is not regarded as a substance, but rather as a process, showing the strong context-dependence which is typical of processes. This is in full accordance with both Peirce's view of a sign and his general process approach to philosophy. A sign, after all, is not a thing, but a triadic relational process through which a Sign vehicle plays its function of signifying an Object and generating another sign, the Interpretant.

We develop in this paper the above analysis in a detailed manner, providing an interpretation of each step in the flow of information in a cell (transcription, RNA processing, translation, and post-translational modification of a protein) in semiotic terms. In this endeavor, we present a model for explaining the emergence of semiosis in cell systems, based on Salthe's (1985) triadic system, also inspired by Peirce.

Cornelius Steckner

Environmental misfit in vision and grasp

Film: "Life as a dialogue with the world"
FILM + talk, 30 min altogether

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Whenever humans are act to grasp a realized object, the accurate shape of the object is anticipated by the grasping hand before actual touch. The time-line of this action and the accuracy of anticipation is well measured and proved. But it is another question to understand the visual transfer of the anticipated object into the grasping hand and the nature of the internal object of anticipation. With this question deals a new series of experiments. These focus the formation of the qualities of the physical
object anticipation. The related experiments in vision and grasp are recorded in the perspective of the experimental subject. In this view the anticipation of the physical object becomes visible, but also the result a disturbed action. The experiments definitely show that normally the internal physical object
anticipation is erased in the moment of external physical contact. But if this process is disturbed, the physical object anticipation remains in the grasping hand unerased (for years). But it is the sort of disruption, to give an idea of the disturbed process, which looks like an environmental misfit in active perception and operation – in other words: a misfit in the functional circle of the human Merkwelt, irkwelt and Umwelt

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Sunday afternoon

Lenny Moss

Abstract not submitted

Andreas Weber

Molecular intentionality: Robust embryological networks and "autonomous agents"

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"Cousins to the ameba that we are, how could we know for certain?"
- Donald T. Campbell

In my paper I want to bring together recent genomics research with the core idea of the self-constructive living process or “autonomous agent” to formulate a minimal model of biosemiotics in action. My aim is to take particular fresh results from genomics research and modelling to demonstrate that the biosemiotic paradigm is more apt to explain their intricacies than the current genetic doctrine is. My text will apply the idea of “genetic scaffolding” (Hoffmeyer) to analyse the minimal requirements of a biosemiotic agent. Experiments (von Dassow et al., 2000; Kulesa et al., 2000) show increasing evidence for much more independence between developmental processes and genes. In simulations, ontogenic growth centers manifested experimental stability when “informed” by different sets of genetic instruction. Stronger still, there was no threshold at which “enough” quantitative tuning sufficed to make the system run: rather, it started running at a certain complexity threshold. (von Dassow et al., 2000). In my paper, I want to map biosemiotic concepts as “autonomy”, “self/other”, “intention” against these latest findings to explore the ground for an empirical working model of a biosemiotic reformulation of genomics.

Mia Krause, Ala Trusina and Kim Sneppen

Adaptation, differentiation and aging modeled as a dynamical network process

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We model biological aging as habit formation in complex adaptational systems. We study the topology and flexibility of the developing network model at different stages of development and suggest that aging is the down-side of adaptation.

Alexei A. Oskolski

Narrative on “biological sense”: an actant model

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A consistent representation of biological knowledge in strictly conceptual form can be acceptable for many biologists only if it is accompanied by *ad hoc* hypothesis explaining functional importance, adaptive value or/and evolutionary history of the subject matter. Otherwise the results of biological research are to tear away as “too formal” or for lack of so called “biological sense”. This problem appears to be arisen from the ambiguity of the biological discourse with its implicit significance of both corporality and objectivity of a living being. However, knowledge of corporality is attained in different way than knowledge of objectivity: the body of living being cognized in the horizon of researcher’s corporality can not be represented by means of strict concepts. This knowledge of the living being’s body is realized in biological discourse as its specific “biological sense”.

Biological research is considered in the present study as a kind of narrative expressing the “biological sense”. Six actants (Subject, Object, Assistant, Opponent, Sender, and Recipient) *sensu* A. Greimas of this narrative have been distinguished. The living being is considered as a Subject that aspires to its survival and/or reproductive success as to Objects. The feature or

process of the research interest are interpreted as Assistants helping to survive or to reproduce (therefore, to attain Object). Its Opponents are the unfavourable circumstances (e.g. environment) endangering the life or reproduction of Subject. Phylogenetic or ontogenetic history is Sender (*Destinateur*) of the situation under study; its Recipient (*Destinataire*) is the researcher's collective body using the knowledge of the living being's body as a means for control and possession of it. If a feature or a process can not be interpreted as Assistant (i.e. its functional or adaptive value is unclear), the "biological sense" is expressed by its aetiological (phylo- or ontogenetic) explanations referring to Sender. Accuracy of the functional, adaptive, or aetiological explanations may be characterized rather as their persuasiveness for the researcher's community (i.e. their relevance for her/his collective body) but not as their logical correctness.

Thierry Bardini

Mapping Metaphors of Junk DNA

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This contribution is an update on my project presented at the first gathering in BIosemiotics. The project aims at documenting and describing in details a frontier of knowledge, between metaphor and scientific matter of fact, on both sides of the border between scientific truth and science-fictions. It is grounded theoretically and methodologically in my work in sociology and history of techno-science, following a constructivist epistemology. The object of the project is a contemporary front of knowledge, the part of DNA that is not coding for the synthesis of proteins, the so-called "junk DNA." More broadly, the aim of the project is to study the shaping and diffusion of the code metaphor in human evolution through looking at the current theories and controversies on the false residual of the information theory metaphor applied to heredity: if the genetic code was first conceived of on an information metaphor, I propose to look at current theories and controversies on "junk DNA" to establish pragmatically the limits and efficiency of this founding metaphor. The methodology of the project, that I called "reverse transmediation" is twofold: (1) extraction and analysis of an on-line hypermediatic archive on the topic of "junk DNA", and (2) extraction from this archive of a sample of significant contributers to be interviewed. Descriptions and analyses from each of these complementary levels will be progressively published electronically (as a "blog"), before standard acadmic publication in journal articles. The project is scheduled over four years, 2002-2006: (1) extraction and mapping of the on-line archive during year I, (2) interviews on year II and III, and (3) analysis and on-line publication in year IV. In my contribution the the fourth gathering in biosemiotics, I will focus on the on-line work and give a few details abouth the on-going interviews.

Karel Kleisner

GENES – MEMES – SEMES. Towards the new concept of mimicry

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Modern biologists focus particularly on a phylogenetical (vertical) aspect of evolution. The old predarwinian conceptions were more sensitive for revealing reticulated character of

horizotal relationships or afinities among phylogenetically unrelated organisms. The mimicry represents a typical antigenealogical phenomenon; as the whole realm of interpretation of an appearance of living forms has been conceptually tied to Darwin's evolutionary theory during the second half of nineteenth century. It was Bates (1862) who first introduced the phenomenon of mimicry in the new light of the selection theory. Thereafter the extant row of selectionist interpretations has been assembled without any significant change (besides several exceptions) in the conceptual frame of the mimicry explanation. But there are some doubts about the veracity and plausibility of the notion that the resemblance in appearance between mimic and its model is caused by the selection pressure of predators only. Therefore we propose the genetic – memetic functional ring providing the interconnection between the ecological and developmental level of description in order to elucidate some examples of mimicry that are problematic in the neodarwinian context.

Jiří Neustupa

Geometric morphometrics – a promise of structuralistic morphology for the science of life

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Morphology, the late „queen of biological sciences" (Velenovský, 1905), has been largely neglected by the upswing of genocentric biological paradigm in 20-th century. However, the methodology of geometric morphometrics (GM) maturing after Bookstein´s „morphometric revolution" of the early 90´s makes the significant impact in current biological perception of shape phenomena. The paradigms of GM approaches explicitly arise from the classical geometric structuralism of d´Arcy Thompson (1917). The relative warps of geometric morphometrics can be regarded as d´Arcy Thompson´s „rules of validity in the structure as a whole". Thus, GM provides the striking possibility of real science of shape facilitating the characterisation and quantifying both the morphospace in individual populations and species and the ontogenetic, ecological and evolutionary structural constraints. The potential of GM methods in the research of phenotypic evolution and shape manifestations of developmental modules will be discussed and demonstrated. Looking for the scientific trends in the dawn of the era of post-darwinian biology (Kull, 1999), we can regard the geometric morphometrics, the living branch of biological structuralism, as one of the promising examples. Anyway, there is a potential for the GM approaches to integrate morphology once again into the mainstream of biological thought.

Luis Emilio Bruni

Signal transduction and categorial perception

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In signal transduction research it is already clear that it will not be enough to quantify and locate all the signal molecules and all the "machinery" for their transduction and triggering effects in a given system (what could be referred to as the "the signalome"). It will be of no help to know all the actors in a megaproduction if we do not understand the languages in which they play.

The multi-modality and modularity of signal molecules and relative "infrastructure" components, poses one of the central problems for understanding metabolic codes: the occurrence of different instances of "cross-talk", "redundancy" and "categorial perception" at different hierarchical levels. In signalling systems and semiotic networks, these phenomena are intrinsically related to each other. Cross-talk and redundancy are already customary notions in biology and, like information, they are being defined inductively in different empirical approaches at different hierarchical levels. On the other hand the term "categorial perception" captures very well the essence of the "outstanding question(s)" in signal transduction. i. e.: how specificity is determined, how ubiquitous signals or messengers convey specific information, how undesired cross-talk is avoided, how redundancy integrates the system. In signal transduction, what determines the possibility for categorial perception is the convergence of complex arrangements of "digital-analogical consensus" which become complex analogical signs that bind the specific context to the specific response. This is then what gives specificity to what otherwise could be ubiquitous "universal signals".
In this presentation I qualify the notions of "cross-talk" and "categorial perception" in relation to signal transduction networks.
Borrowing some key Batesonean concepts I offer a simple framework for interpreting empirical data that deals with such puzzling phenomena.

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Disease as Semiotic Misinterpretation. A Model Study: Parkinson's Disease

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All life processes can be described as sign processes. This is valid for every level of the complex hierarchical organisation that makes up and maintains any organism. Moreover, a change in the nature of signs from iconic to indexical and finally to symbolic can be observed as the hierarchical level of the considered process increases, i.e. signs involved at higher level processes tend to be more virtual. It should also be noted that a more virtual sign is more prone to misinterpretation. From the sign process point of view we hypothesise that any disease can be described as a semiotic misinterpretation. An attempt for such a description will be made for the Parkinson's Disease.
Parkinson's Disease (PD) is a late-onset, neurodegenerative disorder, which affects 2% of the population worldwide. The degenerative process is seen in the dopaminergic neurons located in a certain brain region. Mutations in certain genes lead to familial PD, whereas the aetiology of sporadic PD is largely unknown. The common pathological hallmark of both familial and sporadic PD is the intracellular protein aggregation of various ubiquitinated proteins. In the protein degradation process ubiquitination is a stage, common to all higher eukaryotes. The intracellular apparatus specialised for protein degradation is the proteasome. Proteins destined for proteasomal degradation are tagged by ubiquitin, a small protein. This label is used to direct the proteins to the proteasome, which recognises the proteins by their ubiquitin tails. From a semiotic perspective, the ubiquitin tail can be considered as a signifier and the fact that the tagged protein needs to be degraded as the signified.

Failure in labelling, label recycling, label recognition and other dysfunctions of the degrading apparatus, which are the typical causes of PD, can all be described as misinterpretation of signs at various levels.

Monday morning

Marcello Barbieri

Steps in the history of life. Information, meaning, interpretation and signs

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Biological information and the genetic code are key concepts in Modern Biology, and yet an influential school of thought maintains that ultimately they are but metaphors because they cannot be expressed in terms of physical quantities. A radical alternative to this "physicalist" thesis, is the "biosemiotic" thesis, the view that all living creatures, cells included, live by interpreting the world and by using signs, i.e. by behaving as true semiotic agents. Here a different alternative is opposed to the physicalists thesis. It is shown that organic information and organic meaning are the inevitable result of the processes of copying and coding. This implies that, far from being metaphors, they are as real as the processes that produce them, and in fact they can be defined by operative procedures that make them as objective and reproducible as physical quantities. At the molecular level, however, copying and coding require neither acts of interpretation nor the use of signs. This means that the "semantic" processes which gave origin to organic information and organic meaning are distinct from the "hermeneutic" processes which later in evolution gave origin to interpretation, and from the "semiotic" processes which still later gave origin to signs. Semantic, hermeneutic and semiotic operations, in short, are different types of natural processes and represent very different steps in the history of life.

Fatima Cvrčková, Anton Markoš

Beyond bioinformatics: can similarity be measured objectively in the digital world?

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Analysis of relationships between gene sequences and proteins encoded by them is a part of the standard toolbox of molecular biology. Sequence comparisons are being used in reconstruction of gene and organism evolution, as well as in prediction of gene and protein function. Efficient computational methods for quantitative estimation of sequence similarity are widely available, and their results appear to be *objective*, i.e. the same in the hands of different observers. However, in the world of sequences (both protein and nucleotide) understood as digital strings of letters, only identity (G = g) can be established unequivocally, while there is no clear-cut criterion for similarity (is P closer to R or to S?). Moreover, gene or protein sequences typically differ in length, and only relevant subsequences should be included in comparison. Factors outside the digital strings themselves, such as the chemical and spatial properties of amino acids or presumed mechanisms of gene evolution, have to be

incorporated as “boundary conditions” set by an *understanding* (human) observer, either the author, or users of the gene comparison software.

Alexei A. Sharov

Why biosemiotic systems are hierarchical?

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A cybernetic explanation of hierarchical structures is based on optimization of computation algorithms, which can be combined from several simpler encapsulated modules. This explanation is convincing for the "software" part of systems, but not for the "hardware" part. An additional justification of hierarchies proposed here is that semiosis at a higher level is improved if the lower level is semiotic. In Waddington's model, a small signal (gene) may result in alternating large effects if the system passes through an instability state. However, non-semiotic sub-systems are mostly stable and cannot provide sufficient number of instabilities to support interpretation of numerous signs. Semiotic sub-systems are self-reproducing, and this positive feedback is the major cause of their instability. In the simplest case, they can be in on- or off- states, creating a binary "memory" element, or they can be in multiple self-reproducing states. For example, many transcription factors have their own binding sites in the promoter, creating a self-activating (self-sensing) loop. If this gene is activated by a small signal (e.g., another transcription factor), then it remains active indefinitely. In simple semiotic systems, instabilities are short moments in an overall stable trajectory. In contrast, advanced systems are always unstable, which makes them responsive, and their instability has high dimensionality. Lower level semiosis works as "hardware" because it provides memory and logical switches, whereas the upper level system functions as "software". In developing organism, genes are interpreted sequentially. Early interpretations become embodied in specific structures or tissues, which in turn serve as "hardware" for interpretation of genes that are expressed later. For example, genes that cause variations in vein pattern in Drosophila wings require the presence of wings for their correct interpretation. Wing formation requires a cooperative action of multiple communicating genes. This system is unstable due to its semiotic nature and may serve as "hardware" for interpretation of genes that determine details of wing structure, e.g. veins. In the same way, interpretation of human language is most likely based on lower-level self-reproducing elements in the brain. When we learn a new name or notion we find a non-occupied self-reproducing attractor in our highly unstable neural system, and label it respectively by logical links with other attractors (already known names and terms). Conclusion: although lower levels of semiosis (e.g., micro- and endo-semiosis) are rather independent from the higher-level semiosis in their content, they may give a boost to the higher-level semiosis by providing a rich set of instabilities that can be used for interpretation of higher-level signs.

Almo Farina

Eco-field *versus* habitat: Shifting a paradigm in developing a cognitive ecology

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The eco-field is defined as every meaning-carrier spatial configuration recognized by a species engaged in a specific life trait. This new paradigm offers a bridge between the von Uexkull's umwelt and the spatial arrangement of the environmental context, linking biosemiotic to behavioural and landscape ecology. The eco-field concept states that a species perceives the environmental context (namely the habitat) differently according to the function that is active at that time.
The habitat becomes the ensemble of all the function-specific eco-fields, and the total individual eco-field scores contribute to its suitability. The environmental heterogeneity is copied by eco-fields, transferring the effects of the ecological constraints, through the semiotic code, to the genetic and epigenetic memory of the organisms. The eco-field model allows us to investigate evolutionary and adaptive tradeoff of individual life traits such as mating, foraging, or roosting**,** which emerge as a species-specific ecological plasticity.

Olaf Breidbach

Internal Representations - A Prelude for Neurosemantics

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Modern information technology and cognitive sciences are looking for models to describe new conceptual approaches to understanding knowledge acquisition and knowledge representation. As the failure of classical AI approaches has documented, search systems and expert systems are insufficient to describe knowledge representation in human intelligence. Any new approach has to give serious thought to the associative capacities of a cognitive system and to dynamic reactions in response to changing boundary conditions. Here, the modern approaches that use parallel processing and neuronal network technology might allow the design of new accesses and, thus, the development of new concepts of knowledge acquisition and artificial intelligence. Such a new access can be found in the analysis of system intrinsic characterizations of world representations in a cognitive system. Such analyses of the internal dynamics of complex associative systems have already been proved frameworks of a new generation of expert systems. Some aspects of these ideas will be outlined in the presentation, refering to classical conceptions of cognition. It will be clarified that the hierarchical concept of information transfer as been explicit in the expert systems is insufficient to understand the principle operations of a an associative brain in detecting and categorising its surroundings. An alternative access will be presented at least in some principal outlines.

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Semiotics of individuation and individuation of signs

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Evolutionary and developmental processes involve the emergence of more and more complex hierarchical systems. The Meta System Transition Theory as proposed by Valentin Turchin provides a suitable framework for describing such phenomena. Nevertheless, this cybernetic description fails to account for deeper philosophical aspects of the involved dynamics. One of the missed aspects falls into the category of semiotics. Another one, still deeply related to semiotics, is the process of individuation and the role of the individual as a mediator.
The goal of this paper will be to criticise the purely cybernetic approach and amend it with concepts inspired by the French philosopher Gilbert Simondon.

Wolfgang Hofkirchner

Cognition, communication, and co-operation in living systems

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In this paper i will briefly sketch the basics of information generation in living systems as they manifest in cognitive, communicative, and co-operative processes. I will start from evolutionary systems terms (information relative to phases of metasystem transitions and levels of system hierarchy) and show that they easily translate into triadic semiotic terms (Peirces's firstness, secondness, and thirdness and the constituents of a sign relation which I will call "signandum/signatum", "signans", and "significatio" done by a "signator"). Also i want to point out that dialectical thinking is of great help in this respect (sublation), and i will exemplify each of the information processes with findings in biology.

Günther Witzany

From biosphere to semiosphere to social lifeworlds. Biology as hermeneutical social science

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The change could not be any more radical. Biology, as the classical natural science, has celebrated numerous successes. Examining its subject matter from a reductionist, mechanistic and materialistic point of view has led to exceptional knowledge and given rise to dozens of sub-disciplines. Unfortunately, by pursuing such detail, satisfactory answers to central questions – What is life? How did it originate and how do we view ourselves as organisms – have been lost in a universe of analytical units.

Yet not entirely! A transdisciplinary network is evolving that goes beyond reductionist biology, beyond vitalism or a rekindled (metaphysical) enchantment of nature. It is increasingly able to provide better answers to these questions than firmly established, traditional, mechanistic biology: a semiotics that transcends Pearce, James and Morris to serve as a basis for the interpretation of sign processes in biosemiotics (a), developmental biologists, embryologists and epigeneticists who have turned the paradigm “DNA-RNA-Protein - anything else” on its head and who understand protein bodies as context-dependent interpreters of the genetic text (b), philosophers who see biology as a hermeneutic social science in which the lifeworlds ranging of cell individuals to mega-populations can be investigated based on their communicative interactions (c).