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Teleology, Emergence and Poetics

A primary criticism of teleology is its supposed anthropomorphism. Although Peirce held that final causes are not identical with *conscious* goals, to him purpose is "that form of final cause which is most familiar to our experience" (EP 120; 1902). Whether teleology is anthropomorphic or not, obviously the definitions of human characteristics are never constant. One's understanding of human intentionality may be used revise one's understanding of teleological phenomena and vice-versa. These concepts may be constructed, but they are constrained by physical reality and by each other.

Making, then, what some but not all Peirceans will consider and extension of Peirce's notion of final cause, I argue that the complexity sciences invite us to see teleological phenomena and intentional behavior as specific instances of the more general phenomenon of emergence, not describable in terms of ordinary linear mechanistic causes, i.e. billiard ball causality *or* statistical mechanics, i.e. the sum of effects.[1] It has been noted, though insufficiently, that, emergents have two distinct aspects, which I refer to as directionality and originality. *Directionality* leads to archetypes, self-maintenance, self-organization and homeostasis, that is, emergent dynamical *stability*.[2] *Originality* involves functional adaptations, accidental functionality, or fortunate *change*.

As a literary theorist, I am primarily interested in the creation of *new* meaning. Thus for me semiosis is important as a background against which *poiesis* can exist. I argue that the mechanisms underlying both directionality and originality involve quasi-interpretation of a poetic rather than a semiotic character. Radical novelty emerges from 1. the large scale effects of efficient causes 2. the constraints of the system which provide a context, which is not, as such, an efficient cause 3. the relationships of -- what I consider coincidental and thus poetic -- similarity and contiguity between parts of the system and the way these relationship constrain their interactions, and 4. a functional relationship between one self-organized system and another.

While most descriptions of emergence disallow the possibility of radical novelty (i.e. they flirt with hylozoism), if we begin to account for it by pointing to similarity that makes one object's shape a sign of another's shape and to contiguity that makes one object's behavior a sign of another object's behavior, then we have naturalized the process of sign interpretation that results in creativity and unpredictability, which seems to give complex processes the teleological or intentional freedom to choose.

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[1] Although my view of intention is unconventional, I find some agreement with neuroscientist Walter J. Freeman and philosopher Alicia Juarrero.

[2] My view of directional teleology follows the neutral evolutionary theories of J. P. Crutchfield, Brian Goodwin, and Walter Fontana.

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Synaptic Concept in Expansive Mood: Neuronal Communication is Inherent to Life

Synaptic contacts and communication appear to be widely used in biological signalling. Two closely apposed membranes with their scaffolding macromolecular signalling complexes are extremely useful for exchange of biological information. We will document several examples from animal and plant biology, as well as from single eukarytic cells, to illustrate this essential feature of biological systems. Even bacteria take advantage of this type of communication.

Synapses are stable adhesive domains between two neighbouring cells in multicellular organisms which function in rapid and effective cell-cell communication, as well as in the processing and storing of information. The synaptic concept, which describes the structure and function of synapses, was developed over more that hundred years specifically for neuronal cell-cell communication. In the last ten years, however, this concept was adapted to embrace cell-cell communication phenomena in immulogy, virology, and plant biology. In multicellular organisms, cell-cell communication is of central importance for development, homeostasis, and growth coordination.

Some cells are specialized better than others for more effective cell-cell communication by the possession of specialized cell-cell adhesion domains known as synapses. The word synapse is derived from Greek (*syn* – with, *aptein* – to join). Neuronal and immunological synaptic relations involve two neighbouring cells which form synapse between them by establishing parallel adhesion contact in which diverse adhesive molecules and molecular clamps guarantee structural stability which is essential for their effective communication. Membranes of these synaptic domain exchange signalling molecules, preferentially via secretory activities. For instance, the classical neurochemical synapse is characterized by two plasma membranes with a synaptic cleft between them. Recent advances in cell biology have illuminated other situations in which the synaptic concept is appealing to solve some paradoxes that have emerged from studies on phagocytosis, endosymbiosis and synaptic organellar interactions in eukaryotic cells.

To extend the synaptic concept to the intracellular communication, we will discuss recent findings which led to the inclusion of the phagocytic synapse and propose to further expand the synaptic concept by including endosymbiotic synapses and "intracellular organellar synapses". This broader version of the synaptic concept provides an excellent basis to explain the high capacity of eukaryotic cells for integration of diverse signalling inputs into coherent cellular behaviour. The synaptic communication, as widespread as it appears to occur, may hold the 'key' for a full appreciation of the cell as an information processing unit in all eukaryotic organisms and hence may help to reshape our perception of bacteria and plants as organisms equipped with sofisticated sensory capabilities. The plant version of the neuronal synapse is inherently associated with numerous cell-cell channels representing plant-specific electrical synapses. Because viruses can induce synaptic cell-cell contacts, and cell-cell channels as well as cell-cell fusions, they emerge as agents of potential importance in the evolution of both eukaryotic cells and multicellular organisms.

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Organic Codes and Evo-Devo

Evo-Devo is an ongoing synthesis of developmental and evolutionary biology but the integration of experimental data from those previously independent fields has not cancelled the theoretical divide that has traditionally existed between them. The divide is about the generation of novelty, more precisely about the mechanisms by which biological novelties are brought into existence. Most evolutionary biologists accept the conclusion of the Modern Synthesis, i.e. the idea that natural selection is the sole mechanism of evolutionary change. Embryologists, on the other hand, have traditionally maintained that the major biological novelties are generated by development and that natural selection can only act on them once they have come into being. This classical claim has been recently re-proposed by Scott Gilbert (2006) but remains a minority view in this field. Most supporters of Evo-Devo believe that developmental biology has a very substantial contribution to make to evolutionary theory, but do not see any need to abandon the paradigm of the centrality of natural selection (Holland 1999; Davidson 2001; Gould 2002; Wilkins 2002; Carroll 2005; Ruse 2006).

Here I propose that Gilbert is right in challenging this paradigm and in claiming that there are two distinct mechanisms of evolution, but that he is wrong in saying that the second mechanism is embryonic development. If this were true, we would have to conclude that natural selection has been the sole mechanism of evolution for the entire period that preceded the origin of embryonic development, i.e. for about 3000 million years. More than that. If natural selection was the sole novelty-generating mechanism before the origin of embryos, it must have been natural selection that brought the first embryos into existence. And if the first steps toward development were taken by natural selection why should the other steps have been different? When did the break occur between selection and development? Arguments like these make it difficult to accept the long standing claim of embryology, and that is why the centrality of natural selection appears to be the only reasonable option that we are left with, even when we learn of the existence of deep genetic homology, a discovery that has falsified some predictions of the Modern Synthesis.

There is however another solution to the problem of evolutionary novelty. It is the idea that there have been two distinct mechanisms of evolution throughout the whole history of life. The idea that evolution took place *by natural selection and by natural conventions* from the very first cells onwards (Barbieri 1985, 2003). The second mechanism of evolution, in short, is based on natural conventions, i.e. on organic codes, and has been present on Earth since the origin of protein life because specific proteins cannot exist without a genetic code. This new theory is based on the fact that many organic codes have appeared throughout the history of life and that organic coding is a mechanism of evolution that is distinct from natural selection.

The long standing claim of embryology has been that development cannot be explained by natural selection alone, but now the time has come to generalize it. It is the whole of life that cannot be explained by natural selection alone because there have been natural conventions in all steps and stages of evolution, from the first cells all the way up to embryos and then to brains, minds and finally consciousness.

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Genomic Error-Correcting Codes in the Living World

Using information-theoretic arguments, we have shown in previous works that the template replication of DNA cannot account for the faithful conservation of genetic information through the ages unless genomes are endowed with powerful error-correcting means which make them resilient to casual errors. The conservation of genomes needs their regeneration, thanks to their error-correcting ability, at short enough time intervals. In order to account for the faithful conservation of very old genetic information (i.e., that of *HOX* genes), we further assumed that the genomic error-correcting code consists of a combination of several codes, according to a layered structure referred to as `nested codes' such that the older is an information, the more central is the layer where it is encoded and thus the better its conservation. These hypotheses have far-reaching consequences as regards the living world and its evolution. They explain basic features like the need for successive generations, the existence of discrete species and their hierarchical taxonomy, the overall trend of evolution towards increased complexity, and many others. They also imply that evolution is saltationist and that the genomic information originates in regeneration errors.

The very existence of the living world demands that these hypotheses are true, and their consequences fit very well its overall properties. However, the detailed means which implement the genomic error-correcting codes and genome regeneration remain unknown to a large extent, and their identification is a formidable task. They must be compatible with the highly complex biological mechanisms already known. We notice that the disjonction of regeneration and replication enables the genome regeneration to be performed only in the germinal cells. We also examine the compatibility of our hypotheses with sexual reproduction. The engineering function of decoding is by far the most complex and energy-costly in the implementation of error-correcting codes, so we can plausibly infer that the genome regeneration process is itself complex and costly. In multicellular organisms, the cost of regenerating all the cells of an organism led in many species to a divide between a few germinal cells which can be regenerated and perform hereditary transmission, and a majority of somatic cells which cannot. Germinal cells undergo meiosis, while somatic cells are replicated during mitosis. We may thus think of meiosis as the main step where regeneration takes place, and of the ability to regenerate the genome they contain as the feature which distinguishes germinal from somatic cells. Since the phenotype implements the regeneration process, it can trigger or inhibit it. It is even possible that the phenotype interferes with this process. The phenotype itself is subjected to external stress conditions, so the genome then would depend to some extent on the environment according to some weak kind of Lamarckian inheritance.

However it remains to be determined if what is affected is the genetic content of DNA or, according to the epigenetic point of view, only ancillary functions like methylation or changes in the histones to which DNA is tied. For instance, the experimental study made by Marcus Pembrey et al., concerning inhabitants of the Swedish village of Överkalix, reports evidence of transgenerational effects precisely related to well dated famine events. It clearly points out that these events had transgenerational consequences on the observed subjects only when they occurred during the meiosis of the germinal cells of their grandparents. The proposed explanation to these phenomena involves epigenetic factors, but could as well result from a perturbation of the genome regeneration process. As regards sexual reproduction, we assume that the most peripheral layer of the nested codes system remains uncoded (or weakly protected against casual errors). Sex then provides the expected advantage to promote fast genetic changes in the population, an evolutive advantage against fast varying pathogens or parasites, but confined in the peripheral layer while the information of inner layers remains almost unaffected by replication errors thanks to the genome error-correcting ability.

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From the Genetic Code to a BioMolecular-Based Linguistics

During the 20th century, biology – and especially molecular biology – has become a pilot science, so that many disciplines have formulated their theories under models taken from biology. Computer science has become almost a bio-inspired field thanks to the great development of natural computing and DNA computing.

Moreover, semiotics has known also a transformation with the arising of biosemiotics (Rotschild, 1962; Sebeok, 1972), which deals with the communication and signification in living systems. The study of the semiotic relevance of the genetic code is an active field in this growing science. Therefore, biology and the general science of signs are bridged by an interdisciplinary area of knowledge.

From linguistics, interactions with biology have not been frequent during the 20th century. Since *Syntactic Structures*, the linguistic revolution has taken mainly a formal shape. Nevertheless, because of the "linguistic" consideration of the genetic code, molecular biology has taken several models from formal language theory in order to explain the structure and working of DNA. Such attempts have been focused in the design of grammar-based approaches to define a combinatorics in protein and DNA sequences (Searls, 1993). Also linguistics of natural language has made some contributions in this field by means of Collado (1989), who applied generativist approaches to the analysis of the genetic code.

On the other hand, and only from a strictly theoretical interest, several attempts of establishing structural parallelisms between DNA sequences and verbal language have been performed (Jakobson, 1973; Marcus, 1998; Ji, 2002). However, there is lack of theory on the attempt of explaining the structure of human language from the results of the semiosis of the genetic code. And this is probably the only arrow that remains incomplete in order to close the path between computer science, molecular biology, biosemiotics and linguistics.

Linguistics can take great advantage of the structural and "semantic" similarities between these codes. Specifically, taking the systemic code units and methods of combination of the genetic code, the methods of such entity can be translated to the study of natural language. Therefore, linguistics could become another "bio-inspired" science.

This influence of the semiotics of the genetic code in linguistics is parallel to the need of achieving an implementable formal description of natural language. Therefore, theoretical computer science, by means of its formalization of molecular processes, provides the theoretical tools which are necessary for approaching such exchange of methodology. Syntax, semantics and even pragmatics of natural language can be reformulated from this perspective.

In this way, we obtain a theoretical framework where biology, linguistics and computer science exchange methods and interact, thanks to the semiotic parallelism between the genetic code a natural language.

METTE BOELL
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Molding of moods

This presentation will address a current investigation of several organismic elements that helps sustaining the social networks human beings create in common, when sharing a work relation. Our main focus is the biosemiotic model of links between social ability and emotional states of mind. The talk will be empirically founded in my field studies of the underlying semiotics of social intelligence in a middle sized, highly successful retail chain in Denmark.

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Medical diagnosis in a biosemiotic perspective

We live with a health care system which is composed of many forms of therapeutics and healing practices. They often seem to contradict each other; especially representatives of western biomedicine that dominates health politics, often declares complementary and alternative medicine as 'non-evidence based' or 'non-scientific.' The question is whether this situation is beneficial for patients and innovative research into origin of diseases and potential treatments. In the interest of a scientifically founded discourse, several semiotic models are combined and applied to medical diagnosis.

Methods

The essence of semiotics is that 'generation of meaning' prevails over 'finding the universal truth' about a fact or situation. In this sense it involves a move from the human-become-science attitude of 'who is right' to 'what are the rules for your interpretation'. In order to assess practices in medicine without violating their authenticity by a 'one size fits all' corselet, generation of meaning in the diagnostic sense was the main focus of study. This inherent variety in practices was combined with the context of medical practice, the often confusing complexity of facts and experiences presented in human illness. Therefore, the features of complexity (multifactorial, non-deterministic, non linear, adaptative, self regenerative) have been compared with the semiotic approach. The semiosis has been analysed using the perspectives of Peirce, Morris and Eco. This is developed into a three partite framework which is then applied to some examples from biomedicine, homeopathy and Chinese medicine.

Results

The Peircean semiotic triangle (sign, object, interpretant) is combined with Morris' division in syntax, semantixs and pragmatics. *Signs* are considered the medical symptoms presented, *objects* the diseases they may refer to, and the *interpretant* is the classification system which mediates eventual reference for a symptom to a disease category.

The classification system in its turn is the conceptual level of the medical system analysed, that is the '*syntax'* of the system with its key concepts on illness, health and cure. This level requires a historical analysis of the cultural models used during the origin of the medical system in question.

The different categories constitute the *semantic* aspect of medical diagnosis. The *semantic fields* as described by Eco are used to demarcate differences in meaning of symptoms depending on which medical practice is analysed. The difference between denotation and connotation and its consequence for reference of sign to object are clarified. Text analysis of medical diagnostic texts is the method used here.

The selection of symptoms is the *pragmatic* aspect of diagnosis, the actions in conversation and examination for selection and eventual deletion of symptoms. This is studied with discourse analysis. The negotiation process between patient and doctor raises issues about power and role division: who is the expert of interpretation?

Conclusion

Bio-semiotic analysis shows the usefulness of *generation of meaning* as a central concept for analysing the diagnostic rules valid in the complexity of different form of medical practice.

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What does it take to be able to produce an interpretant? Biosemiotics and complexity science

As biosemiotics is trying to finish building its disciplinary matrix it becomes clear that there are disagreements about what it takes to produce signification. There seems to be differences in philosophical frameworks especially in the stipulation on ontology and epistemology and their relational interdependence. Some researchers seems to think that they can stay in a physical paradigm relying on classical physics, thermodynamics and quantum mechanics, other seem to think that a cybernetics-informational paradigm will fulfill their requirements (like Terrence Deacon) others that some kind of second order cybernetic-autopoietic paradigm like Niklas Luhmann's is sufficient to solve the mystery of signification, meaning and understanding. Then there are the Peircean biosemioticians that have to face Peirce's semiotic philosophy and metaphysics. Most of them tries to avoid the full consequence of it as it leads to serious classes with the received view of science with its three categories, hylozoic view of matter and mind and his Agapistic integrative view of science and religion.

The major problem is that Peirce brings mind and consciousness into his basic metaphysics as the pure feeling of Firstness. Biosemioticians that wants to be scientific and stay within biology and not be too philosophical are in obvious trouble. Can biosemiotics present a compromise where life and semiosis co-inside, but without explaining the emergence of life and mind through pre-biotic semiosis in nature in some sort of pan-semiotics? Claus Emmeche has stressed the organicistic view with its theory of emergence based on so called *Complexity Science* with its concept of CAS (complex adaptive system) as a solution. The term CAS means an open system in a thermodynamic gradient (far from equilibrium as what Prigogine calls dissipative structures) with many strongly-coupled degrees of freedom, non-linear connections, feedback mechanisms, often exhibit hysteresis and therefore has pre-stages to memory functions, they often have a hierarchical or heterarchical complexity, dynamic networks locally differentiating and have emergent and holistic properties.

Complexity science has moved science away from a linear mechanistic view of the world to one based on nonlinear dynamics, evolutionary development and systems thinking. Thus as such the theory simply cross the line between non-living, living, conscious and social systems without bothering about the qualitative differences in them. This is very much in the tradition of cybernetics, systems science and information science on which it draws (if we neglect radical forms of holism). The basic problem of life, mind and signification is simply ignored on the basis that they are presumed to be explained based on the scientific foundation. But this is never spelled out. There is just a vague idea that life and consciousness are emergent qualities of basically physical/material systems and in this way there is no challenge of the received view of material science. Life and matter is a new organization of dead matter as physics describers it. But how is a complexity science view compatible with Peirce's semiotic, *hylozoic agapism*? Maybe in the claims of some that CP do not believe in absolute natural laws but more in generative rules.

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Where's the Sign? The Single Cell as an Urmodel of Perception

This paper examines how single prokaryote cells may use perceptions of quantum wave information sign signatures to interrelate (cooperate/conflict) within the environment, of which they are part, in order to pursue their needed outcomes, namely to survive, to grow, and to be fruitful. Our main research hypothesis is: *the sign given out for others to perceive is a 'qualisign' information signature modulated upon the quantum electromagnetic wave (EMq-wave) emitted by the source signator for other signator sources to perceive.*

This paper is a part of a larger 'work in progress' developing an Organization Development Theory about peoples' use of sign processes to orchestrate their (cooperative/competitive) work outcomes. Examining the single cell's perception situation within the cell's individual internal and external environments (*Umwelt*) is significant because perceptions are conducted strictly at the cellular level, no matter how simple or complex the life form is.

We examine how these cellular perception interrelations can be accomplished by semiotic sign encoding through the process of modulating source EMq-waves by a sign signature of the emanating source's qualities (qualisigns). Whether the source is what we call a thing or an event, it emits a cicadian-like EMq-wave broadcast, if you will, that informs all within reach of that modulated EMq-wave with information about the signator's presence, qualities, and place. Of course, if other entities (cells) are beyond the reach of that EMq-wave broadcast or do not have the ability to perceive (intercept with its own EMq-waves), transduce, and decode the original signator's sign signature, that source does not exist in those entities' umwelt. Those cells that can perceive those broadcast EMq-waves' particular signature modulations as information may find that information to be useful to them in pursuit of their life project.

We examine how the complex perceptual sign interrelations, external to and within the cell, bridge the physical and biological realms through transducing the quanta/qualities signs of the physical realm into life supporting information for the biological realm. In this bridging process the single cell bacterium is able to organize its values and its resources in order to perform the actions it needs in order to achieve the for its life work: namely, to sustain its life, to grow, and to pass its gift of life on to viable daughter bacteria.

The paper poses some questions for Biosemiotics:

1. What experiments can be designed to prove/disprove the physical presence of information sign signatures in biological EMq-waves?
2. What instruments need to be developed to examine biological EMq-waves?
3. How information signatures in EMq-waves can be digitized into computer models of cellular perception processes?

The long success of perception ability of bacteria, however they accomplish perception of their *Umwelt,* is shared by all of us living on earth today. We are partners in their communal life project. We, the new kids on the block, can argue about whose life project this is; agreement is not required. And those that come after us will have their work cut out for them indeed. The environment never stands still, nor can life.

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Is the umwelt in the associative cortex? Or is the associative cortex in our umwelt?

In this article I confront J. von Uexküll's notion of "umwelt" to other notions that have been used in gestalt psychology and cognitive sciences - such as "perception field" and "mental image" - in the light of recent work in cognitive neurosciences. I try to place the "umwelt" concept in the debate that opposes "direct realism" to "representationalism" (indirect realism), as recent work in cognitive neurosciences seems to suggest that mental images without a physical correlate (i.e., imagination, dreams, etc.) implicate similar brain substrates as images that involve processes of (direct or indirect) perception.

One limit in cognitive neurosciences is the extreme importance being allocated to brain mapping in detriment of a hierarchical perspective, which should attempt to link emerging levels. What is important from the biosemiotic point of view is not only how an image is formed but what sort of association it brings about. In this direction I try to establish a link between biosemiotics and what has been called the "affective sciences" as a way of approaching the important questions that relate emotions to perception, and yet more important those that relate "significance" to emotions and thus to perception.

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Biosemiotics and biohermeneutics

In current moment in circle of biosemioticians there are several persons (S.Chebanov, A.Marcoš, G.Witzany), who define their activity as «biohermeneutics». Besides there is significant paper by M.Boden "Hermeneutics of biology" (1985). Actually biohermeneutics is perceived as one branch of biosemiotics. Nevertheless principal relationship between biosemiotics and biohermeneutics is not clarified. This is basis for some remarks about this relationship.

1. In current moment biohermeneutics is not unitary field of investigation and it is possibility to speak about different versions of biohermeneutics belong to different authors. The mutual feature of these versions are interest to processes of interpretation taken place into living organisms and interest to hermeneuticses (different types!) as to special investigation programs.

2. From my point of view there are five alternative field of knowledge, dealing with semiotic means – hermeneutics, philology, linguistics, semiotics, and pragmalinguistics. Studies of semiosis in living being are possible inside each of these disciplines. Nevertheless historical circumstances determined the widest spreading semiotics namely in current time. This situation defined most popularity of biosemiotics correspondingly.

3. In principal hermeneutics and semiotics have completely different ideas about the nature of semiotic means – for hermeneutics corresponding of the plan of expression and the plan of the contents is motivated, the body of a semiotic means and a material of the plan of expression have great significance for existence of semiotics means, semiotics means has a lot of interpretation depending on the one who is the interpreter, etc. The semiotics answers the formulated questions in the opposite mode.

4. The modern data about semiotic means in living beings specify what hermeneutics is the most suitable tool for the description of biological semiotics means (a genetic code, neuromediators, pheromones, etc.). Therefore biohermeneutics is the most adequate to investigated biological semiotics means. From the basic point of view, biohermeneutics is not a part of biosemiotics, but it is alternative of biosemiotics. Nevertheless, both and biosemiotics, and biohermeneutics deal with the same phenomena. These circumstances define why biosemiotics and biohermeneutics have so close interaction.

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The biosemiotics of imaginary codes

Biosemiotics was inspired by language and, especially, models of sign relations. Yet, to accommodate organic coding (Barbieri, 2003), triadic models need to be replaced by dynamic ones (Barbieri, 2006).

As we talk, think and feel we show belief in entities called signs. In Wittgenstein's (1958) terms, that is 'how the game is played'. This leads many to regard linguistic codes as imaginary (Harris, 1980; te Molder and Potter, 2005). Such views, however, typically overlook how players are constructed. To avoid this omission, I ask how organic processes turn us into players of strategic games and, later, believers in imaginary codes. The paper pursues this logic, first, by critiquing views that reduce language to verbal patterns. Second, it sketches how semiosis prompts infants to use circumstances. My thesis is that nature and culture shape agency which, thanks to organic coding, prompts us to belief in linguistic signs. Eventually, we adopt a language stance (Cowley, 2007).

Verbal patterns lead our thinking astray (Linell, 2005). While words dominate written texts, they are historical supplements to human expression. In conversation, they are typically secondary and, in learning to talk, marginal. First-order language connects social action with biomechanics or, in lay terms, the *unsaid*. Dialogical events need not rely on words because human social strategies draw heavily on interpersonal dynamics. These prompt self-organizing cognitive and affective events that link social routines to full-bodied expression. Talk is indeterminate in form (Love, 2004), links cultural context (Linell, 2005) with neural dynamics (Thibault, 2005) in a kaleidoscope of connotations (Kravchenko, 2007) and values (Hodges, 2007). Language is distributed in time, space, and across bodies (Cowley, 2006). Talking resembles dancing (Shanker and King, 2007) rather than practices based on encoding and decoding verbal patterns (Love, 2007).

Far from depending on second-order cultural constructs (words), talk may be based in organic coding (Cowley, in prep). Special neural systems prompt infants to find social interaction motivating while their brains use semiosis to re-organize how they feel, act and (later) think. Co-action whose dynamics are constrained by adult beliefs (about language, values, babies etc.) transforms human agency. The baby needs no *a priori* signs, sophisticated categories and, certainly, no interpretant or neural word-symbols (Cowley, 2004; 2006; Cowley et al., 2004). Rather, intrinsic motive formation (Trevarthen, 1998) enables the baby to use local social opportunities to discover what interaction affords. This, I argue, is sufficient to grasp how caregivers interpret vocalization (Cowley, 2007). Indeed, before *hearing* vocalizations *as* words, infants come to use utterances in self-serving ways. Later, with first person phenomenology, they adopt the language stance and a (narrative) self. In our cultural matrix, they accept the fiction that mastery of language depends –not on activity –but a naked brain (or mind).

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Magnetotactic Bacteria as a Challenge for Semiotic Descriptions

Magnetotaxis is observed in some unaerobic and microaerobic bacteria living in stratified high water columns. Magnetotactic bacteria have compass-like organelles called magnetosomes attached to their bodies such that they automatically align with the magnetic field lines in their environment. In general magnetotactic bacteria in the northern hemisphere are known to seek magnetic north, while those living in the southern hemisphere do the reverse. The functionality of this behaviour is classically explained referring to the fact that - except for the equator- the magnetic field lines of the Earth have a vertical component, downward in the northern and upward in the southern hemispheres. It is supposed that these bacteria use the field lines to seek the depths appropriate for their survival.

At the first look magnetotaxis seems to resemble the better known phenomenon of chemotaxis in bacteria. However, from a semiotic point of view this resemblance asks for a more meticulous analogy and a careful identification of the components of the sign process. As a matter of fact, the alignment of magnetotactic bacteria to magnetic field lines is not a semiotic but a physical process: the bacteria do not "sense" the field lines but are physically aligned to them. Therefore for an individual bacterium the magnetic field is not a sign but just a property of the environment, i.e. the context within which other signs (e.g. the sensed oxygen concentration) have a specific meaning. On the other hand, it is possible to assert that the magnetic field and the rate of survival constitute a basis for a sign for a lineage of magnetotactic bacteria living in a given region, and adaptation involves lineage learning.

In this contribution, magnetotactic bacteria will be used as a case study to elaborate on semiotic descriptions of natural processes with special emphasis on different organisational levels. Such an elaboration seems to be essential for avoiding misunderstandings in semiotics.

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Biosemiotics and the biological sciences – a Kuhnian perspective

Biosemiotics was from its very start proclaimed as a possible alternative paradigm of biology. After the initial conferences and gatherings in biosemiotics, time is ripe for an assessment of the nature of the field of biosemiotics, seen from the perspective of the history and philosophy of science, especially the tradition following Kuhn. I will attempt to characterize the poly-paradigmatic nature of the field of biosemiotics, its relation to the biological sciences, as well as the 'non-Kuhnian' nature of biosemiotics – and biology in general. It will be argued that we can gain important insights about the nature of biosemiotics by applying the Kuhnian perspective, but in a modified form, as Kuhn's approach has limitations regarding the nature the biological sciences. Examples from the history of evolutionary biology show a close cooperation between philosophers and practicing researchers, and as a part of the assessment of biosemiotics similar relations can be studied. As the project of assessing biosemiotics as a science and a field of scholarly studies raises normative issues on what counts as genuine research, these issues will be addressed from the perspective of contemporary sociology of science.

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DNA Organization- Boundaries, Territories And Islands

With the advent of genomic sequencing it has became widely accepted that most of the DNA in multicellular eukaryotes does not code for functional proteins. In the present work we shall question the non-coding status of some DNA sequences based on the fact that their recognition can triggering specific biologic responses of greater complexity than catalytic processes. As it has been extensively discussed by biosemioticians, codes depend on properties other than the material composition of the template information, properties that are only converted in meaning when a machinery has been selected that recognizes them and at the same time convert them into products of greater complexity, working as adaptors between two independent worlds with no necessary, physical connection. In the case of the so-called coding DNA these properties are easily observed as the sequence of nucleotides within a gene are converted into proteins by the ribotype.

We shall argue that in the case of non-coding DNA sequences other levels of organization (not the nucleotides base composition) will be informative to other selected assemblies (not the ribotype) to trigger other specific responses (not protein synthesis). The systematization of living systems in a categorical framework consisting of CELL/SELF/SENSE as the levels where stable configurations occur has been previously discussed in more detail, here we will use these only to illustrate how DNA organization increases its complexity and acquire different coding properties through the levels. Non-coding DNA can have various regulatory properties *i.e.* recruitment of transcription factors *in cis* (promoters); recruitment of transcription factors *in trans* (enhancers); recruitment of chromatin remodeling and Histone modification machineries; recruitment of epigenetic modification (somatically inherited) machinery.

In any case, the function of a non-coding DNA region will be related to organization patterns *i.e.* repetitive sequences can be recognized by structural proteins to induce chromatin compaction, a process that can be modulated in various ways. The examples of non-coding sequences of particular interest, as insulators, chromosome territories and the Locus Control Region, will be examined in greater detail to establish the contribution of organization constraints in code-making, the importance of oscillatory and cyclic information patterns will also be developed.

ALMO FARINA AND DAVIDE MORRI
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Exploring the semiotic nature of bird soundscapes: A methodological approach

Bird soundscape can be defined as the information produced by acoustic activity (song, call, alarms). Despite an impressive literature on the acoustic activity of birds and related patterns of individual species, generally restricted to the breeding season, few attention has been paid to the acoustic information and its significance at assemblage level. Our contribution intends to investigate the meaning and the probable use of the soundscape as an information field (eco-field) utilized by birds not only to delimit a territory but also to perform other functions like social cohesion, localization of food resources, roosting selection, predatory escaping strategies, etc.

Bird activity is usually investigated by using standard census techniques (mapping, point counting, line transect, etc.) but the presence of an human observer modifies the spatial arrangement and the behavior of birds during the census work; this introduces severe biases on the accuracy of the results, producing a confounding scenario.To overpass such methodological constraint we have obtained the spatial information of aggregated acoustic performances of birds by using a digital audio tape-corder suspended at *an ad hoc* cableway located across a landscape.

This methodology offers the advantage to move the data logger remotely, changing the speed of the movement and modifying time and location of recording sites along the transect, when the recording is made from fixed points. To test eco-field hypothesis and to put on trial the device the acoustic information from 64 sessions, carried out during July 2007 along a 500 m cable way transect, was processed according frequency, intensity and individual acoustic performances of classified species. The first results confirm the reliability of the method and the great potentialities to test the hypothesis of the bird soundscape as a collection of eco-fields utilized by these animals to perform a variety of functions.

DON FAVAREAU
University Scholars Programme, National University of Singapore

De Anima and *De Interpretatione*: Aristotle on Life and Signs

The centrality of the Aristotelian *Organon* as the primary "instrument of logic" throughout the whole of the Middle Ages – as it was read, debated, understood and commented upon by countless medieval scholars who themselves had no access to, nor awareness of, the corresponding Aristotelian texts on nature and biology that were lost to the West at this time – meant that the focus of the next dozen centuries, at least as far as the investigation into "sign relations" was concerned, would proceed from Aristotle's meditations of the sign *exclusively* as it is manifested in human experience.

Accordingly, investigations into bio-logic and investigations into semeio-logic became increasingly discontinuous throughout the rest of the Middle Ages, as the scholastics' assumption that what they would come to call the "mental word" (*verbum interius*) – and what we might designate more precisely today as "linguistically mediated experience" – was to be the natural starting point and, eventually, the exclusive focus of "sign" study.

This artificial "breaking apart" of the subordinate study of human words and propositions that Aristotle addresses in *De Interpretatione* from the superordinate study of animal organization and interaction in the world that Aristotle develops in *De Anima* – a more or less accidental bifurcation owing to the contingencies of history – has had profound consequences for the next dozen centuries of philosophic inquiry, and by extension, for the subsequent foundation of modern scientific thought.

This talk will attempt to re-read Aristotle's thought in the order that he presented it, and thus to read Aristotle's sign logic of humans in the light of his biology of living systems. It will argue that the observations about semio-logic in *De Interpretatione* can be understood as a particular subset of the observations about bio-logic in *De Anima* (and in *De Sensu et Sensibilibus*) – and that the notion of the study of *biosemiotics* is very much in the spirit of the man who noted that:

> A physicist would define an affection of soul differently from a dialectician …the latter assigns the material conditions, the former the form or formulable essence …Thus the essence of a house is assigned in such a formula as 'a shelter against destruction by wind, rain, and heat'; while the physicist would describe it as 'stones, bricks, and timbers'; Which, then, among these is entitled to be regarded as the genuine physicist? The one who confines himself to the material, or the one who restricts himself to the formulable essence alone? Is it not rather the one who combines both in a single formula? (*De Anima: i*).

ELISEO FERNÁNDEZ
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Signs, Instruments And Self-Reference In Biosemiotics

We propose to explore some problems and deficiencies in current approaches to biosemiotics and offer some tentative solutions or improvements. For these purposes we approach our field not so much as a separate discipline but rather as a program for a radical re-conceptualization and generalization of theoretical biology in the light of the essential role played by semiotic and instrumental notions in biological modeling. We consider a triple approach to this task.

First: we offer an examination of the historical origins and development of the traditional exclusion or lack of integration of semiotic considerations in the life sciences. We examine these issues in connection with some parallels in the history of the conceptual development of physics.

Second: we sketch an attempt to integrate under a single perspective three elusive conceptions which appear ubiquitously, under diverse guises, in the work of several important biosemiotic theorists. These are the notions of **triadicity**, **self-reference** and **final causation**.

Third: we carry out an analysis of the manifold meanings of the concept of **instrument** (*organon*), its role in scientific modeling, its special status in living systems, and its connection to the three conceptions mentioned above.

Finally, we show how the conclusions reached through these three approaches converge into a perspective that leads to new ways of relating **signs** to **instruments**. This in turn suggests the possibility of expanding Peircean semiotics to include the relations of the triadic action of signs (semeiosis) to the action of different kinds of dyadic **mediators** (different types of instruments).

CHARLES GOODWIN
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The Multi-modal Organization of Human Action

A primordial site for the constitution of language, human action and cognition consists of a situation in which multiple participants are carrying out courses of action together while attending to each other, the detailed organization of the talk in progress, relevant phenomena in the environment and the larger activities they are engaged in. Within such a framework it is possible to investigate phenomena such as meaning and cognition not as abstract processes lodged entirely within the mental life of sentient beings, but instead as public phenomena constituted through actual agent-object inter-action.

When actual courses of action are examined, it quickly becomes apparent that a range of quite diverse phenomena are implicated in even single instances of agents interacting with both each other and objects. Human action is built through the co-articulation of different kinds of signs in different media which mutually elaborate each other, and in so doing become environments for each other. Talk itself contains multiple sign systems with alternative properties. Strips of talk gain their power as social action via their placement within larger sequential structures, encompassing activities, and participation frameworks constituted through displays of mutual orientation made by the actors' bodies. The body is used in a quite different way to perform gesture, again a class of phenomena that encompasses structurally different types of sign systems.

Both talk and gesture can index, construe or treat as irrelevant, entities in the participants' surround. Moreover, material structure in the surround, such as graphic fields of various types, can provide semiotic structure without which the constitution of particular kinds of action being invoked through talk would be impossible. The construction of action through talk within situated interaction is thus accomplished through the temporally unfolding juxtaposition of quite different kinds of semiotic resources.

This talk will focus on the mutual contextualization of language, different kinds of displays being made by the participants' visible bodies including gesture and participation frameworks, and relevant structure in the surround. Data is drawn from videotapes of human interaction recorded in range of natural settings including conversations, archaeological excavations, and interaction in the home of a man with severe aphasia.

ARNO L. GOUDSMIT
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Self-referentiality and sensitivity in living beings

This contribution will focus on the relation between computation and sense. The living organization is believed to be self-referential and closed as a system.This self-referentiality eventually permits distinctions between logical levels of ongoing processes to be only locally valid.

Likewise, a living being's sensitivity to its environment is also to be understood as a self-referential exploration. Accordingly, it will be argued that the organizational closure is expressed in the organism's sensitivity. Furthermore, it is this sensitivity that cannot be caught in terms of a formal procedure. It is dropped whenever a simulation of the living is constructed, in favor of a simulated sensitivity. Therefore, it makes sense to look for it beyond the confines of computability and hierarchical control. Sensitivity is taken as a basically unformalizable quality, expressible only in the absence of strict definitions.

I will present a model which focuses upon the absence of computable relations.

JESPER HOFFMEYER
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Biosemiotic design is 'intelligent'

Recent attacks on scientific theories of evolution based on the belief in so-called intelligent design cannot easily be dismissed. Rather one should ask where the apparent 'intelligence' comes from. That the evolutionary 'intelligence' should reflect God's finger prints is of course a hypothesis that cannot scientifically be dismissed, and which - for the same reason - is not scientifically interesting. Biosemiotics, however, may explain the emergence of apparently intelligent designs. The paper will analyze a set of problems connected to this thesis.

KALEVI KULL
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Biosemiotic theory of evolution: Both an alternative and a generalisation of the Darwinian theory

(I) Darwinian theory of evolution is based on the mechanism of selective non-continuation or natural selection as the *sine qua non* for an adaptive evolution to occur. The evolutionary event would start from a stochastic genetic variation, and the evolutionary change would take place due to a differential reproduction of genotypes. Thus a genetic change occurs prior to the corresponding populational and phenotypic change.

(II) An epigenetic, or Baerian theory of evolution is based on the mechanism of organisms' adaptiveness that affects gene expression. The evolutionary change would start from a phenotypic (physiological) adaptation or adjustment of the specimens of a population, and this would be fixed as an evolutionary change if stochastic genetic changes make it irreversible. Thus a genetic change follows the populational and phenotypic change.

According to the (I), everything in life is a result of evolution and is based on evolution. According to the (II), evolution is not neccesary for life to occur, life simply cannot avoid evolution, evolution is rather a side-effect of living processes.

A biosemiotic approach, assuming the communication or sign processes comprising the life's general frame and essence, can evidently accept the (II), because the epigenetic view is in a good coherence with a communicative approach. If (I) could be taken not as a worldview but restricted to the role of differential reproduction of genotypes, then (I) can be interpreted as a special case of (II), having certain importance in particular evolutionary situations.

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A Transdisciplinary Invitation To Socio-Semiotics

Semiotics constitute a transdisciplinary approach. Within a tentatively comprehensive transdisciplinary model set, the paradigmatic model of *semiodynamics* permeates from potentiality fields to systems, evolution, complexity, (semiodynamics) and the noo-sphere. Connected (loosely) to life science disciplines, *bio*semiotics stimulated basic semiotic research into the biology connected domains. Under that roof, progressing clearance also of e.g. ontological, epistemological and methodical foundations paved the way for the extension to other disciplines. In particular the humanities, that is philosophy and philosophy/theory of science were addressed. Philosophical considerations were undertaken on men's understanding of himself in his world, as were methodological quests. Originating from signs and language, topics like e.g. higher consciousness (mind and matter), thinking/evaluation, learning and anticipation are investigated. Neuro-sciences appear a favoured candidate.

The broadening of semiotic fields leads to the anthropologies (including history). Functionally and evolutionally language, convictions and belief systems are constituted not merely as individual but as societal phenomena. A part of semiodynamics, the specific dynamics of semiosis, of grouping, of society building and of societal constitutions are called *sociosemiotics*. What comprises societies, lets them grow and dissolve? Which inroads do semiodynamics open into culture and, actually, into the impacts of a technology based civilization? How does planning and control connect to semiosis based anticipation? Social behaviour in humans is carried both by the rational reasoning of intellect and emotional feeling. Its intentional character, potentials and constraints need complementarily be reconciled from a semiodynamics, a socio-semiotics view. Such a re-thinking may shed light on the troubles of a fast changing world and the accompanying cultural/religious confrontations, the shift of wealth and power. It may also support a feasible policy.

KOICHIRO MATSUNO
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Quantum Mechanics as a Basis of Biosemiotics

An empirical basis of quantum mechanics is in the occurrence of those events addressable in the present perfect tense in second person description. The notion of a quantum after Max Planck certainly witnesses the occurrence of a quantum of light, that is, a photon, discretely punctuated by both the emission and absorption completed in the perfect tense when it interacts with matter. Material interactions render themselves approachable in second person description as specifying each party of any pair of interacting bodies exclusively in a bilateral manner. When the interaction takes place through exchanging a piece of material body between a pair of arbitrary interacting partners, the exchanged body can act as a sign to be exchanged between the pair. Exchange interaction of quantum mechanical origin is a sign process in progress.

Quantum mechanics on the spot is a sign dynamics approachable in the present progressive tense, while the recorded dynamics registered in the present perfect tense is describable as the symbol dynamics anchored in the present tense in third person description since the record belongs to the public domain as carrying the third person status. The leftover of the sign dynamics from the frozen symbol dynamics, the latter of which is free from any of sign actions, is part of a sign that is yet to be interpreted or settled by the concerned party. A sign of material origin functions as an IOU for meeting the requirement of precipitating the legitimate perfect tense, but its global settlement is inevitably being postponed by constantly passing it over to the nearby interacting partners available. Those unpaid IOUs at any moment come to invite a wide variety of settlement or interpretation among the interacting bodies. Biosemitoics takes full advantage of circulating and paying the unsettled IOUs of material origin while allowing the participating material bodies to be involved in inventing a de novo form of IOU as ever.

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Encounter probability in proto-semiotic system: theory and computer simulation

Encounters between material elements in a living system, or between living systems in the living world, are very important events for them to develop and maintain a specific organizational pattern. Collisions between molecules in a living cell, for example, cause chemical bonding or reaction to produce molecular process of metabolic cycles, signal transduction in the molecular system of intra-cellular regulation triggered by environmental cues, and so on, by which the cell can maintain the internal organization to function in the environment. Similarly, encounters between organisms, such as predators and prey cause changes in their number, leading to a particular dynamic pattern of ecological community.

In this talk, we analyze encounter events and the probability using a computer-simulation model which incorporates a proto-semiotic process, in which semiosis is defined as 'selective and discriminative cognitive action depending on the correlation between local and non-local events'. Specifically, in the model we examine the probability for a focal cognizer to encounter with target entities, mediated through a semiotic field based on physical field such as electromagnetic force, or chemical field such as density gradient of molecules. We show how semiotic properties of system–the whole or a focal subsystem– can affect the probability of encounter events, and discuss the results for developing a complex semiotic system model in the future.

YAIR NEUMAN
Office for Interdisciplinary Research, Ben-Gurion University of the Negev, Israel

Memory: A Bio-Semiotic Perspective

"Memory" is a term we use to discuss a variety of psychological and biological phenomena, such as "immune memory" and "human memory", apparently sharing only surface similarity. The common conception of memory is evident in cognitive psychology, where memory is defined as the "organism's ability to store, retain, and subsequently recall information." (Wikipedia). The perspective underlying this definition heavily relies on the computer metaphor, assuming memory is a device used by the mind to manipulate a database of information.

In this presentation, I would like to criticize this common conception of memory and to offer a novel alternative. Based on preliminary ideas discussed in a recent paper (Neuman, in press), I would like to suggest that **memorization** involves the orchestration of reversible and irreversible processes of computation through semiotic mediation. By adopting this approach we may explain deep level similarities between various memorization activities such as immune memory, memory of cell's fate, and various deficiencies of human memorization.

STEPHEN PAIN
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The Sponge: On the cusp of Integrated Semiotics

This paper will look at a representative species (idealised) of the phylum Porifera. It will be structured along the same lines as the author's comparative study of semiotics in invertebrates (Pain, 2007). Focus will be on the behaviour and cognition of a sponge, and whether its primitive neurophysiology is capable of processing and integrating external information at a level commensurate with the lowest threshold for semiotic communication.

In a previous case study the author argued that the Moon jellyfish, a representative of the phylum Cnidaria, was capable of basic semiotic processing and communication as shown in its navigation and migration. There the sites were eight marginals which could be likened to protobrains or CPU units. In the absence of obvious sites in the sponge, and given its extremely simple biological systems, it is a glorified pump, the case study poses a challenge for biosemiotic analysis.

It has been argued previously (Pain, 2007) that certain neurophysiological structures and processes are needed for biosemiotic communication (other than descriptive semiotics, i.e. from the point of view of the researcher), the sponge as an organism tests these. Furthermore, the author will in the paper raise important questions relating to the foundations of learning and cognition.

JOHN PICKERING
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What's wrong with vitalism?

In 1899, the biologist Ernst Haeckel declared: "The great abstract law of mechanical causality now rules the entire universe, as it does the mind of man." By 1970, another biologist, Jacques Monod, announced: "Science shows that pure, blind chance alone underlies the whole stupendous edifice of evolution. There is no alternative to this view, no matter how appalling it may seem to us, being the intensely teleonomic creatures we are."

Appalling as it may be, the epistemological and technological achievements of the past four centuries show the scientific worldview is highly effective. But these achievements do not of themselves justify the belief that only what science tells us exists is all that exists. Ontologically, the scientific worldview is incomplete and restrictive.

Most scientists and philosophers disagree. The more common view is that atoms in the void is all there is. Newtonian mechanics provides nothing that corresponds to "now". Nor does quantum mechanics, unless we are to believe that the collapse of the wave function distinguishes 'before' from 'after', and most physicists do not.

Now, unless atoms enjoy subjectivity, this makes experience in general, and reflexive consciousness in particular, an alien anomaly in a universe that is 'really' 'merely' matter in motion. A sense of existing *through* time with a phenomenologically unique present, a remembered past and an anticipated future, must be a mistake. As Einstein wrote shortly before his death: "For us believing physicists, the distinction between past, present, and future is only an illusion, even if a stubborn one."

But most human beings do not feel their sense of temporality is illusory. Like Descartes, they find no reason to doubt they travel only one way through time. Common sense experience is to be trusted, physics notwithstanding.

What might biosemiotics contribute to this age-old conundrum? This paper will propose, in the spirit of Peirce, James and Dewey, that semiotics in general provides a temporalised, and hence more humanly recognisable, worldview. Moreover, it does so without compromising scientific rigour. Biosemiotics in particular offers the conceptual tools needed to show that temporalised experience is neither alien nor anomalous. It will suggest that, taken together, the profound similarities between Pierce, Whitehead and the later Merleau-Ponty, are the means to extend scientific understanding to include human experience. It may be, though, that this will be regarded as a step too far towards vitalism. Evidence will be offered to show why this is not so.

ANDREAS REICHELT
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Motor control approaches to goal directed behavior

Recent developments in biological motor control shed further light on the issues of control and communication and may thus be of interest to biosemiotics.

To illustrate the diversity and range of concepts in biological motor control, I will focus on two different approaches. The notion of equilibrium point control demonstrates how goal directed behavior can be explained in physiological terms by exploiting biomechanical properties of the skeleto-muscular system (Bizzi et al. 1995). I will focus on how this approach has begun to address goal directed, context dependant behavior of spinalized frogs (Poppele & Bosco 2003), that has haunted physiology for over a hundred years (e.g. Huxley 1874).

The very different notion of internal models has become a dominant conceptual and explanatory framework in motor control. Internal models are a sophisticated control concept in that they integrate feedforward and feedback control – leading to a partial rapprochement between the philosophically loaded stances of internal vs. external control. This framework firmly links motor control to motor learning and planning. As is always the case in physiology, there are a number of open questions, both conceptual and empirical (Desmurget & Grafton 2000, 2003, Davidson & Wolpert 2005).

Furthermore, there has been a recent *social turn* in motor physiology. Most widely known are neurobiological findings of the Parma group of Rizzolatti et al., of mirror neurons in premotor cortical area F5 (Rizzolatti & Craighero 2004). This line of work has progressively revealed a more integrated picture of the relationship between perception and action. Recently, their account of how sensorimotor circuits underlie visuomotor behavior has been extended through the discovery of neurons in inferior parietal cortex that have higher order mirror properties (Fogassi et al. 2005). In addition, there are other approaches in motor control that demonstrate links to social understanding from different starting points that will perhaps lead to a more integrated view.

From a behavior oriented perspective, social coordination was demonstrated by comparing eye movements trajectories of people in a social situation (Flanagan & Johansson 2003). There are also attempts to integrate internal models with mirror circuits, from the perspective of control theory and biorobotics (Miall 2003, Metta et al. 2006)

WALTER RIOFRIO
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Looking at the Beginnings: Enquiries about Emergence of Cognition in Evolution

Trying to understand when and how the cognitive phenomena arise in evolution continues being a hard problem of confronting. Another important issue is referring to find the explanatory framework which integrates the different observations and data in neuroscience investigations. These situations lead us to ask a question in regards to whether there are underlying general principles to the so-called neural code: What might the relationship be that is established between the neuronal responses and the sensory signs or signals that these supposedly represent?

In fact, one important task is to find the ways in which we will be able to arrive at those explanations that will enable us to understand how living beings put together perceived sensory information as well as how they represent it. In this brief paper, we address some conceptual questions involved in the relationships between sensorial information perceived by brains and its representational capacities. Specially, we propose that it is possible to defend the physical origin of Information. Therefore, we will study the implications to use the information notion as an ascribed concept and its relationships with using this same notion like denoting something in the reality.

CORNELIUS STECKNER
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When a Baby Points at a Flower: The Sign and the Environment in the Concepts of C.S. Peirce and J. v. Uexküll

"When a baby points at a flower and says 'Pretty', that is a symbolic proposition; for the word 'pretty' being used, it represents its object only by virtue of a relation to it which it could not have if it were not intended and understood as a sign.[...] In like manner, all ordinary propositions refer to the real universe, and usually to the nearer environment." [Peirce: Baldwin Dictionary, s.v. Subject]

In this example, the pointing arm is the subject. The environment-related model of triadic sign-generation C.S. Peirce had developed in his "Questions on Reality" (1868). There his concept of representation based on the Achilles argument of the Zenonian paradox, to explain firstness in a series of cognition. This process of sign-generation in 1898 William James called stream of consciousness (Psychology, Chapter XI).

J. v. Uexküll in his model of the functional cycle understands environment also as a subjective stream. In his concept first there is a noticeable (Merkmal), calling for an active response to destruct the first perception, and to repeat the process again, constituting the environment, which is just the conceived in the cycle, dependent on the limitations of the subject's receptors and effectors.

The concept of Peirce had an experimental basis, which only partially is known. But what is known, will show some more common aspects in the two concepts of sign-generation.

FREDERIK STJERNFELT
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Roots of biosemiotics in German thought

This paper traces the relation between von Uexküll's Umweltlehre and his Hamburg colleague Cassirer's semiotic philosophy. The younger Cassirer was influenced in two rather different ways by his older colleague: as the biologist providing contrast material to philosophical anthropology - and as the organicist which permits Cassirer to attack vitalism and articulate an intermediate position between mechanism and vitalism.

GOTTFRIED SUESSENBACHER
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Prehistoric fire usage - The prime origin of memes?

Considering the transition from prehuman to human existence the german philosopher Hans Blumenberg designated fire usage as the central "differentia specifica" (1981). According to him the factors which determined the evolution of our species became unrecognizable and lost their function (p. 182).

Resuming Blumenbergs thought this paper hypothesizes that fire usage was an adaption to the recurrent environmental condition “fire”: An adaption which evolved as an increasing interplay between a necessary control of affects (a), a multitude of gradually collaborating cognitive abilities (b) and the development of sufficient communication/ interaction (c). The related evolution of the (pre)human brain may have led from functional to quantitative alterations of certain parts, especially of the prefrontal cortex, the central process of which may have been caused by the mesostriatal and mesolimbocortical dopaminergic system. In this way the dilemma of an interference between the evolving “neocortical” and the archaic “subneocortical locus of control” (Panksepp, 2005) may have been solved.

Such a brain evolution could have introduced a permanent system perturbation (Rudrauf, & Damasio, 2005) - experienced by human individuals as self-consciousness. However, the competences mentioned above (achieved in the context of fire usage) may, presumably, have been transfered to many other fields of life. Indeed, this hypothesis offers an example of signification on many levels: The level of neurons and “higher” levels up to most levels of human culture seem to show replications of fire usage-characteristics. This paper shows how - based an the principle of imitation - possible roots of ritualized behavior may have developed to the rich memetic tree of early species of the *Genus Homo*.

MORTEN TØNNESSEN
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Umwelt transition and the Umwelten of domesticated animals

[D]ie Behauptung, dass die variierenden Individuen einer Art mehr oder weniger gut ihrer Umwelt angepasst seien, ist völlig aus der Luft gegriffen. Jedes variierende Individuum ist entsprechend seinem veränderten Bauplan anders, aber gleich vollkommen seiner Umgebung angepasst. Denn der Bauplan schafft in weiten Grenzen selbsttätig die Umwelt des Tieres.
Jakob von Uexküll

The artificially homogenized populations of man`s domestic animals and plants are scarcely fit for survival. *Gregory Bateson*

According to Jakob von Uexküll, the Umwelt of an animal consists only of those questions that the animal can answer. In a world of rapid environmental change, however, his statement that all animals are perfectly fitted to their Umwelten can only be part of the story. As the environment is changing, so are the Umwelten – which are, when challanged, either adapted to the new environmental conditions, or vanish. One characteristic of (globally or locally) endangered species seems, in Uexküllian terms, to be the emergence in the life of these species of systematic difficulties in finding answers to its questions in its environment. What is a species about to go extinct, if not a species that asks questions that no longer makes sense?

From a contemporary point of view, one weakness with the Umwelt theory as depicted by Uexküll seems to be its reliance on a world view in which the environment is generally stable. It should be possible to overcome this weakness, and thus adapt the theory to contemporary circumstances, by developing a notion of *transitional Umwelten*, i.e., Umwelten undergoing substantial change. The phenomenon of *Umwelt transition* (or *Umwelt adaption*) can be understood as a permanent, systematic change, within the life cycle of a being – be it an individual organism, a population, a species or a lifeform – from one typical appearance of its Umwelt to another.

The ecological crisis can be regarded a global Umwelt transition with historical roots in (among other things) humankind`s domestication of animals. By exploring this prominent example of a class of Umwelt transitions I will sketch how domestication has changed the biosemiospheric landscape, and what distinguishes the Umwelten of domesticated animals as opposed to wild animals. What is „natural" to a cultural animal?

In *Semiotics. A Handbook on the Sign-Theoretic Foundations of Nature and Culture,* Paul Bouissac ("Interspecific communication") claims that "communicative interactions [between animal and men] belong to two categories: (1) manipulation of behavior and (2) emotional compensatory fallacy". While it might be the case that man-animal communication is asymmetrical by nature, such interactions should not be described purely in terms of "manipulation" and "fallacy". The manipulative character of most man-animal relationships is a historical and cultural fact, not a biological or existential necessity that a human Umwelt transition (i.e., cultural change) cannot undo.

BAREND VAN HEUSDEN
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Getting rid of the sign

As a starting point will I take the remark by Eco (in *Semiotics and the Philosophy of Language*, 1984) that signs are not empirical realities, and I will try to work out what that could mean for a science of the sign.

When we inquire into what turns something (that is: anything!) into a sign for somebody, this leads us to a very specific cognitive process. Once we acknowledge that we are dealing with a cognitive process (semiosis), it becomes easier to link semiotics to the sciences of the mind and of life. Signs are processes, and these processes are empirical realities that can be studied. As *cognitive* processes, they pertain to the realm of the sciences of cognition, but as *semiotic* processes they belong to the research domain of semiotics – which is why I see semiotics, including linguistics, as one of the main branches of cognitive science.

The question to be answered is, then, how to characterize the process of semiotic cognition. We have to focus (a 'reculer pour mieux sauter') on the general process of representation (the *genus*), if we want to find out what the *differentiae specificae* of the semiotic representation (the *species*) are. Representation is defined as the whole of sensory-motor and neuronal patterns of behavior that allow an organism to interact successfully (in terms of its homeostasis) with, and survive in a certain environment (its 'Umwelt').

The hypothesis I would like to present and elaborate upon, is that this very general process of representation (which could also be characterized as the 'memory' of an organism, or species) becomes semiotic – that is, signs appear – when it is doubled, thus forcing the organism to a process of comparison between more or less stable representations and instable representations of an always changing environment. In this process, the stable representations become signs, used to deal with the *difference* an instable environment generates. Semiosis implies difference and change. This change is threatening, but it also offers opportunities. The doubling of the representation process radically changes the process of adaptation and accommodation as it occurs in most organisms through natural selection, trial and error and imitation processes. It allows certain primates to manipulate representations independently from the environment they are (cf. Merlin Donald's work on *mimesis*). These manipulations can be shared with others, because when acted out, or externalized, in artifacts, they can be perceived, communicated and stored.

I will argue that this 'dealing with difference', which is so characteristic of the semiotic process, has a certain logic to it, which may eventually allow us to characterize the evolution of the human culture

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The failure of evolutionary epistemology — a lesson for biosemiotics?

Evolutionary epistemology (EE) can be characterized as a predecessor or a close relative of biosemiotics. Both are based on the idea that certain concepts that we mainly refer to human cognitive processes are generalizable and extendable to characterize also certain biological processes and phenomena.

The core idea of EE is to recognize the analogy between knowledge-acquisition or learning and evolutionary adaptation through natural selection. In Donald T. Campbell's and Konrad Lorenz's EE, an abstract "variation-selective-retention-and-reproduction" (VSRR) algorithm, abstracted from Darwin's conception about natural selection, is seen appropriate to model all examples of increased fit between one system and another — all increasing fit between system and environment is seen as a sign of some kind of evolutionary learning process or evolutionary knowledge-acquisition. Such evolutionary learning is not restricted at the genetic level.

The selection theory or 'Universal Darwinism' is taken as a basic theoretical hypothesis of EE in three different senses: 1. all knowledge processes *actually* use VSRR-method, 2. they exploit various lower level VSRR-processes, and 3. they have been produced by some earlier lower-level VSRR-processes. I.e. mere selection theory does not suffice for EE, but it includes essentially a hierarchy theory of knowledge levels. In it, three different hierarchies are joined together: historical production hierarchy, entailment or embeddedness hierarchy, and control hierarchy (downward causation).

In spite of its apparently strong and restrictive theoretical basic statement, the deeper inspection shows that selection theory (with hierarchy theory) does not really form a testable scientific hypothesis. Even though it avoids optimality adaptationism, it still tends to produce 'just so' stories of adaptive origin of cognitive systems and implicit VSRR-subprocesses. If some particular knowledge process does not seem to use unmotivated (blind) variation in its seeking of satisfying solution, it is automatically assumed that this subsystem has been produced by some and it is using some hidden subprocess in a lower level. These are assumed a priori, for the sake of intelligibility, just like the bad manners of sociobiologists in their project of explaining everything by natural selection. As a consequence, selection theory can never be falsified — speculative assumptions about some hidden VSRR-process can always be made.

Even though such dogmatic Darwinism is rare and sometimes perhaps even too radically rejected in biosemiotics, biosemiotics is not safe in falling on similar type of error. Useful interpretative or code-processing habits of organisms and other biosemiotic systems are easily assumed likewise to have been 'learned' at some level so that but self-organization (co-development) and exaptation are possible origins as well.

While for EE, one source of this failure was a too dogmatic commitment to Universal Darwinism, in biosemiotics the strong intuitions of superiority and generality of semiotic point of view or pansemiotic ideas tend to have analogous consequences. Common source of confusions and errors for both is the vagueness in the basic ideas of knowledge or sign/representation in their application to biological systems and processes.

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An evolutionary analysis of the ecological information-based theory of perception

In the 1960s and 1970s, the ecological psychologist James Gibson introduced an information-based theory of perception. This theory was a significant departure from the traditional view. First, Gibson was one of the first theorists who took evolutionary theory seriously in thinking about perception. Second, and relatedly, Gibson asserted that the animal's environment in and of itself is meaningful. That is, meaning is not a product of the mind, as was and is held by many psychologists; rather it is out there in the environment and can be perceived. Third, Gibson took aim at the idea that the stimulus information available to the senses is impoverished and needs to be enriched. In his view, the information available to the perceptual systems is rich. More specifically, the information contains a specification of the environment, allowing the animal to be in direct perceptual contact with it.

Since Gibson's death (in 1979), many psychologists found inspiration in his ideas and tried to develop them. The dominant ecological psychologists took Gibson's ideas of specificity to be central to their approach to perception, arguing that animals rely on informational variables that are specific to the environment, that is, that relate one-to-one to it. The prevailing neo-Gibsonian approach, however, has been criticised for being inconsistent with evolutionist thinking (Reed, 1996). In this talk, I will argue that the exclusive search for specifying information that perceptual systems are supposed to detect, is indeed at odds with evolutionary considerations on perception. It does not leave room for individual differences in what information is exploited and, thereby, runs counter to population thinking. In addition, it is inconsistent with the now widely accepted idea that evolution is not an optimising agent and often results in sub-optimal solutions. Hence, to be evolutionarily plausible, a new theory of perceptual information is called for.