Dept. of philosophy and history of science


FACULTAS RERUM NATURALIUM

9th Gathering in BIOSEMIOTICS
30. June – 4. July

:: international society for biosemiotic studies ::

This conference was supported by:

The Global Perspectives in Science and Spirituality Major Awards Programme, a joint programme of the Interdisciplinary University of Paris and Elon University

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Useful conference information

Maps of the event places in the back!

Currency:
1$ = cca 20 CZK
1EUR = cca 26 CZK

TAXI Service:
We recommend to use the **AAA Radiotaxi company, phone: 14014**, yellow cabs

Transportation from the airport and around Prague:
You can either use a taxi or the **rich net of public transport**. Standard tickets are valid for 75min (transfer ticket **Basic** for 26 CZK) so bought at the airport they will take you all the way to the city centre (the bus 119 to the metro Dejvická station and than metro to the Můstek station for example)

Registration:
You can register for the conference 30. June 14.00 – 17.00 on the registration board at the Carolinum building (ground floor, Ovocný trh 5, Prague 1, see map). The registration office will move to the conference building for the other days.

Lunch vouchers for July 1-3:
If you want to use the advantage of a table reservation, you can buy conference lunch vouchers to the nearby Czech and beer speciality restaurant "Pivovarský dům". These are available in the registration office for CZK 200 each.
It is necessary to buy the voucher at least one day before to save you a place reservation. You can choose your meal from the local menu; should you pay less than what you payed for the voucher, you get normally reimbursed as if you paid by cash. Nevertheless Prague is literally full of restaurants – check the internet.

Dinner party:
It is necessary to buy your dinner party ticket on **the first day: Tuesday 30. June!** You can buy it at the registration point.

9th Gathering in Biosemiotics – Prague, 30 June – 5 July 2009

The Programme at a Glance

Tuesday, June 30	Arrival day – Opening lectures, registration and Welcome Party
14.00 – 17.00	Registration at the Carolinum building, Ovocný trh 5, Prague 1
17.00 – 18.00	Opening Lectures, Modrá posluchárna – Blue auditorium, Carolinum
	Anton Markoš: Towards Darwinian biosemiotics
	Timo Maran, Karel Kleisner: Semiotic Selection, Cooption and Good Old Darwin
18.00 – 19.00	Get-together drink

All undermentioned lectures take place in Viničná 7 conference room

	Wednesday 1	Thursday 2	Friday 3	Saturday 4 July
09.00 – 09.30	Eugenio Andrade	Stephen Cowley	Peter Harries-Jones	Thierry Bardini
09.30 – 10.00	Kalevi Kull	Martin Neumann	Alexei Sharov	Argyris Arnellos
10.00 – 10.30	Marcello Barbieri	Marco Stella	Dominique Lestel	Jonathan Hope
10.30 – 11.00	*Coffee*	*Coffee*	*Coffee*	*Coffee*
11.00 – 11.30	David Leavens	Ryad Benosman	Isabel Ferreira	Mark Reybrouck
11.30 – 12.00	Natalia Abieva	Maciej Pokora	Jerry Chandler	Gérard Battail
12.00 – 12.30	Fatima Cvrčková	Paul M. St. Pierre	João Carlos Major	Yulia Volokitina Prisca Augustyn
12.30 – 15.00	*Lunch*	Business Lunch P. Augustyn	*Lunch*	
15.00 – 15.30	Stephen Pain	Paul Cobley	Marcella Faria	
15.30 – 16.00	Irena Pátková	Myrdene Anderson	Franco Giorgi	Afternoon
16.00 – 16.30	Erbach-Schönberg	Eliseo Fernandez	Morten Tønnessen	*EXCURSION*
16.30 – 17.00	*Coffee*	*Coffee*	*Coffee*	
17.00 – 17.20	Jana Švorcová	Robert Prinz	Maria Dmitrieva	
17.20 – 17.40	Michaela Zemková	Fabio Bacchini	Anna Aragno	
17.40 – 18.00	Michal Schmoranz	Sara Cannizzaro	Martien Brands	
18.00 – 18.20	Ted Baenziger	Tamara Popowski	Andres Luure	
20.00	Round Table *		*Dinner Party*	

* Public discussion on the concept of meaning chaired by Don Favareau

	Chair	*Chair*	*Chair*	*Chair*
Morning	Don Favareau	Dominique Lestel	Stephen Cowley	Kalevi Kull
Afternoon	Marcella Faria	Karel Kleisner	Don Favareau	

DATES AND TIMES OF CONFERENCE EVENTS (**see maps in the back**)

Tuesday, June 30

Registration opens at 14:00 in the Carolinum, Ovocný trh, Prague 1. Opening lectures take place in Carolinum, get-together drink takes place in the historical interior of the Carolinum ground floor. All participants are welcome.

Wednesday, July 1

Round Table discussion on biosemiotics organised by Marcello Barbieri and Anton Markos, free refreshments, Vinicna 7, conference room. All participants are welcome.

Thursday, July 2

Workshop on Uexküll translation with Prisca Augustyn, Restaurant “U Kroka”, Vyšehradská 31, Prague 2

Friday, July 3

Dinner party on the summer terrace of the functionalistic restaurant Mánes with a Prague castle, Dancing House and National Theatre view. Tickets at Euro 20 available at registration; Masarykovo nábřeží 250, Prague 1, starts 20:00

Saturday, July 4

Prague Venice excursion. All participants are welcome.

9th Gathering in Biosemiotics – Prague, 30 June – 5 July 2009

Lecture overview

Tuesday 30.6.

17:30 - 18:00	Timo Maran	**Semiotic Selection, Cooption, and Good Old Darwin: Is There a Common Basis for the Explanation of Mimicry, Sexual Selection, and Domestication?**

Wednesday 1.7.

09.00 – 09.30	Eugenio Andrade	**Evolution by Natural Abduction**
09.30 – 10.00	Kalevi Kull	**On consortia, umwelten, and biophony (and the ecological codes)**
10.00 – 10.30	Marcello Barbieri	**On the definition of meaning**
11.00 – 11.30	David Leavens	**Ape Pointing: A Case Study in Distributed Cognition**
11.30 – 12.00	Natalia Abieva	**Indexical species: acquisition of external semiotic competence in human evolution**
12.00 – 12.30	Fatima Cvrčková	**Context-dependent meaning in plants: a model for non-animal semiosis**
15.00 – 15.30	Stephen Pain	**The Barnacle and the Whale: a Fable of Semiotic Explanation.**
15.30 – 16.00	Irena Pátková	**Reading bacterial messages**
16.00 – 16.30	Erbach-Schönberg	**Generating signal transduction codes with an evolvable network representation of cells**
17.00 – 17.20	Jana Švorcová	**The hourglass, the zootype and the phylotypic stage**
17.20 – 17.40	Michaela Zemková	**Linguistic metaphor of life – potential and limites of its application in analysis of different texts**
17.40 – 18.00	Michal Schmoranz	**Becoming a semantic object. Bacterial colony as a bio-aesthetic model**
18.00 – 18.20	Ted Baenziger	**Phytosemiosis in Orchids**

Thursday 2.7.

09.00 – 09.30	Stephen Cowley	**From biomechanisms to interpretation**
09.30 – 10.00	Martin Neumann	**The semiotic construction of social reality**
10.00 – 10.30	Marco Stella	**The Invention of the Clever Hans Effect: Was Sebeok Right?**
11.00 – 11.30	Ryad Benosman	**Neuromorphic Asynchronous Images : toward a new paradigm of image-based semiosis**
11.30 – 12.00	Maciej Pokora	**Link between common YES-MAYBE-NO head gestures and directional properties of human vestibular system**
12.00 – 12.30	Paul M. St. Pierre	**Biosemiotic Neurobiology of Finger-Snapping as End-Effector Sonic Signaling Process**
13.00 – 14.30	Prisca Augustyn	**Workshop: Uexküll Translation Project**
15.30 – 16.00	Myrdene Anderson	**Information – Vague, General, Curious, Spurious**
16.00 – 16.30	Eliseo Fernández	**Biosemiotics and the Relational Turn in Biology**
17.00 – 17.20	Robert Prinz	**Cells as semiotic systems practical and quantitative implications**
17.20 – 17.40	Fabio Bacchini	**Biological Cluster and Properties as Real Signs**
17.40 – 18.00	Sara Cannizzaro	**Flexible models: on differentiation, systems and biosemiotics**
18.00 – 18.20	Tamara Popowski	**A Derridean Approach to the Biosemiotic problem**

Friday 3.7.

09.00 – 09.30	Peter Harries-Jones	**All Over the Map: Heterarchical Topology for Bateson’s Context and Meta-Context**
09.30 – 10.00	Alexei Sharov	**Partitioned semiosphere: barriers of communication and relativistic epistemology**
10.00 – 10.30	Dominique Lestel	**How To Make Sense of Animal Complex Semiotic Activities?**

11.00 – 11.30	Isabel Ferreira	**Towards a biologically-motivated approach to Meaning**
11.30 – 12.00	Jerry Chandler	**A Natural Number System for Biosemiotic and Medical Signals**
12.00 – 12.30	João Carlos Major	**Neuronal versus Relational Man**
15.00 – 15.30	Marcella Faria	**Cell-Matrix Adhesion Complexes and their Dynamic Assembly:The Poetics of Cell Migration Control**
15.30 – 16.00	Franco Giorgi	**Receptor Oligomerization as a Mechanism controlling Cellular Semiotics**
16.00 – 16.30	Morten Tønnessen	**On contrapuntuality. Semiotic niche vs. ontological niche: the case of the Scandinavian wolf population**
17.00 – 17.20	Maria Dmitrieva	**Directions in Interpretative Biosemiotics**
17.20 – 17.40	Anna Aragno	**The Biosemiotic Roots of Psychoanalytic Metapsychology**
17.40 – 18.00	Martien Brands	**Metaphor comprehension in patient doctor interaction. A biosemiotic perspective.**
18.00 – 18.20	Andres Luure	**The semiotic threshold and the threshold of life**

Saturday 4.7.

09.00 – 09.30	Thierry Bardini	**How Can Simondon’s Relational Ontology Contribute to Biosemiotics?**
09.30 – 10.00	Argyris Arnellos	**Emergent Representations, Digital-Analog forms and Biosemiotics: Integrating the tools to model complex phenomena in living organisms**
10.00 – 10.30	Jonathan Hope	**Umwelträume and Multi-Sensory Integration**
11.00 – 11.30	Mark Reybrouck	**Musical sense-making between nativism and empiricism: an evolutionary approach to musical semantics**
11.30 – 12.00	Gérard Battail	**Living versus inanimate: the information border**
12.00 – 12.30	Yulia Volokitina	**Reconstruction of a Russian-language site in biosemiotics**

Indexical species: acquisition of external semiotic competence in human evolution

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There have been several proposals to establish evolutionary semiotics as a separate discipline (Donald 1991, Tomasello 1999, Wildgen 2004, Johansson 2005). Nevertheless none of the possible scenarios have been generally accepted. The main difficulty – overcoming the gap between the biological and social levels of semiosis (Barbieri 2007), between animal signals and purely human signs – remains. Thus the two trends in semiotics (biological and social) still oppose each other. Two reasons are: (1) underestimation of communicative paradigms research and (2) the infatuation with human symbolic competence.

In the paper it is shown that all life-forms are dependent on semiosis (Sharov 1991, Hoffmeyer 2001), and living systems continuously process information. While comparing biological and specifically human forms of information exchange, it is possible to separate out communicative forms that are not embedded but are the results of human social evolution. The interpersonal external *off-line* communication (Abieva 2008) is believed to be the cardinal one that redirected the course of human evolution. The claim focuses on the way early Homo passed the results of acquired experience to later generations thus creating a precedent for no other species communicate *off-line* (when the addresser and addressees are distanced in time and space).

Semiotic competence in humans cannot be reduced to symbols only, as language is a late invention on the life-scale, and there had to be certain preadaptations for it (Hurford 2003). The cognitive investigation of prehistoric artifacts enables us not only systematize the stages of semiotic evolution (from indexical through iconic to symbolic in humans) in examining the *gradual* increase in semiotic competence, but refer the results to certain cognitive changes that had to take place to make these changes possible. The theory of bilateral functionalism of the brain, fused with intersemiotic translation (Jakobson 1959, Hoffmeyer 2002), provides the basis for describing the mechanisms of dual information coding and processing (Kosslyn 1980, Paivio 1986, Hoffmeyer & Emmeche 1991) at certain stages of semiotic evolution.

It is proposed that due to the dominance of the visual thinking early Homo first acquired ability to communicate *off-line* via *indexes*. Knapping technologies, Footprint Literacy (hunter's literacy) (Avital 1998) and handprint phenomenon are treated as facts of intentional indexical semiotic activity used to externalize knowledge. The claim is that the indexical paradigm of communication developed from biological forms of semiosis directly and preceeded iconic and symbolic code systems in human evolution.

Information – Vague, General, Curious, Spurious

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Practitioners in biosemiotics, no less than those in semiotics as a whole, find reference to "information" natural and necessary if not inevitable. However, whenever critically foregrounded, "information" resists definitive explicit treatment, whether by translation, analysis, or operationalization. Clues to this endemic condition exist in the compound lexeme itself. "Information" came to English relatively recently (in Middle English, through Old French from Latin). A similar derivative situation obtains with corresponding labels in other related and unrelated languages. There is nothing ontologically firm about "in-form-a-tion". While the label is of recent coinage, the actual senses of "information" have proliferated unchecked within and beyond information science, philosophy of science, and semiotics.

One seldom-acknowledged issue with "information" in English, is the Indo-European linguistic habit, and preference, of "thingifying" notions that may also be fruitfully unpacked as processes or even something entirely different. Other issues arise when "information" emerges from the vagueness of firstness, when "information" precipitates from general habits in thirdness, when "information" serves as constraint in a physical medium, when "information" is motivated by assumed intentional or nonintentional "senders" and "receivers" or interpreters, and when "information" varies with the vagaries of interpretance, and possibly more.

This paper seeks to diagnose and relate the senses of "information" that pertain to the biosemiotics project. Salthe and others have pulled together the varieties of "information" drawing on Shannon's information theory (a decrease in uncertainty tilting toward predictability), on a dissipative structure's self-organization with its proliferation of possible states launched upon the material constraints on entropy production, and on Bateson's notion of 'a difference that makes a difference' to some system of interpretance. While there may be some curious intersections among these approaches in a thingified sense, they are unlikely to submit to fully explicit definition. Nonetheless, it is possible to hold in mind the various senses of "information" on a situation-by-situation basis.

"Nothing interesting can be defined. Corollary: Anything might be interesting". (anonymous)

Evolution by Natural Abduction

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I argue that the problem of the origin of evolutionary variations that has polarized the scientific community between NeoDarwinians or adherents of blind chance and NeoLamarckians defenders of environmentally directed variations must be reinterpreted in the light of epigenetic theories like Developmental Systems Theory (DST) according to which evolutionary variations depend also upon the behavioral and developmental responsiveness to local environmental conditions. DST proposal would be a specific case of peircean ontology that conceives evolution as a process of sign interpretation. There are six peircean predicates or relations described by Taborsky (2005) and applied by Andrade (2007) to the understanding of evolutionary theories, namely: 1. firstness as firstness (chance), 2. secondness as secondness (discretedness and determination), 3. thirdness as firstness (statistical law), 4. thirdness as secondness (biological codes), 5. secondness as firstness (individual elections) and 6. thirdness as thirdness (tendency to form habits). The first four are considered with differing biases in existing evolutionary theories, nonetheless an account that depends solely on them is insufficient. However, the two latter (2-1), (3-3) are not fully understood. They are best tackled as an analogy to the process of abductive inference by means of which a new hypothesis is advanced aiming to cope with a new fact of observation by making an original use of previous accumulated knowledge along evolutionary history. This creative solution posed by organisms shows how the response to local conditions of life is the determinant factor of evolution and at the same time accounts for its open an unpredictable character. It will be shown that natural abductive inferences account for the evolutionary tendencies: 1. to vary and diverge, and 2. to find new interactions that open up evolutionary potential. Thence, I propose a higher order peircean graph in which every element of the darwinian triad (variation, heredity and selection) is represented a as sign. So that this higher order graph summarizes an expanded Darwinian interpretation in the following manner: [Natural abduction (*input*) → Tendency to form habits (mediation) → Genetic accomodation (*output*)]. To conclude the implications of this approach to evolutionary epistemology and evolutionary economics are proposed.

Andrade, E. 2007a. A Semiotic Framework for Evolutionary and Developmental Biology. BioSystems 90: 389-404.

Taborsky, E. (2002) The Six Semiosic Predicates. In: SEED Journal (Semiosis, Evolution, Energy, Development), 3(2). pp 5-23.

The Biosemiotic Roots of Psychoanalytic Metapsychology

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> "We must call on the Witch to our help after all!"
> Goethe, *Faust*, Part I, Scene 6.
> (*Freud*, 1937, p 225)

Who is the witch? How can she help us? why did Freud invoke her?

This paper will answer the above questions providing background information on the historical origins, fierce controversies over, and subsequent demise of, the most cherished aspect of the Freudian opus, while illustrating how his observations and conceptualizations already contained the seeds of a bio-semiotic general theory of mind with far reaching implications.

Freud foresaw that the popularity of the clinical method threatened to override its function as a *scientific* research methodology thereby obfuscating his *metapsychology* a term so rarely uttered these days that most people both inside and outside the field don't know what it refers to. By 1915 Freud's primary interest was in articulating his *metapsychology*, a polyperspectival framework through which he tried to describe explanatory principles for the transformative processes his 'talking' method brought to light emphasizing that the scientific foundations of psychoanalysis lay not in the material with which it deals but in the *way it works*. With only rudimentary knowledge of neurobiology and no adequate grounding in development, linguistics, dialogics, or semiotics, disciplines that burgeoned after his death, the conceptual framework he devised was composed of metaphors derived from the physics of his day. The task he left was to find a conceptual framework -- an appropriate scientific paradigm -- that could encompass and advance our understanding of the pluralistic phenomena and multidimensional yields of his methodology. Instead the field forged on by dissension and fragmentation forming divisive clinical 'schools' all practicing some version of his dialogical method without providing any unifying explanatory metatheory.

In several revisionary papers and two books - "Symbolization" (1997) and "Forms of Knowledge" (2008) - both of which shift the foundations of metapsychology into the operative principles of a developmental, bio-semiotic general theory of mind, in total isolation this author has single handedly attempted to update, integrate and operationalize what is still descriptive, metaphorical and divisive, and inadvertently found congruence with principles underlying the new field of Biosemiotics. This paper will forge a bridge between a psychoanalytic approach to human bio-semiotic fields and the broader sense of the term in Biosemiotics.

Emergent Representations, Digital-Analog forms and Biosemiotics: Integrating the tools to model complex phenomena in living organisms

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The informed structures of a system ground its intentional and purposeful behavior based on the variety of organizational forms they can support during interaction between the system and the environment. On this perspective, each in-formation complex constitutes the respective organizational variability of a system in terms of a state of affairs, insofar as this in-formation virtually bears the interactive potentialities of the system, i.e. the semantic and pragmatic content, or alternatively, the meaning of the system regarding a certain state of affairs. As such, any system's functional reaction to an external perturbation or triggering during its interaction with the environment is the result of an internal interpretation or assessment. In other words, any such interaction causes and implies the in-formation of the system's organizational structures and, consequently, the construction of new meaning or the usage of already existing meaning for the continuation of its functional interaction with the environment.

This analytic description of the notion of representation is also the essence of the Interactivism framework as exemplified by Mark Bickhard. This framework seems crucial when one considers the emergence of representation in a complex system. However, one may face many problems in attempting to apply the framework to model phenomena in complex living systems.

We examine the possibility of complementing the notion of emergent representation with other approaches to representation such as the ones appealing to a Digital-Analog interplay between different levels of organizational forms in a living system, the notion of the Levels of Representationality, and the types of representation implied in Biosemiotics.

Our research will have as a primary aim the establishment of a more robust theoretical framework for the emergence of representations and simultaneously, for the ways information is transduced across several interconnected organizational levels in a complex system. The aim is to open the way towards realistic tools for pragmatic modeling of complex phenomena in living systems.

Workshop: Uexküll Translation Project

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There is no doubt that making more of Uexküll's *Umweltlehre* available in English will not only further the biosemiotic movement, but also fill a gap in the foundational theoretical canon of semiotics in general. The objective of this paper/workshop is (1) to give the biosemiotic community an update on the Uexküll translation project and (2) a discussion of the translation of Uexküll's *Theoretische Biologie* (1928) that revolves around the following questions:

- In how far can a new translation become a "clarification" and biosemiotic "reframing" of Uexküll's *Umweltlehre*?
- In how far is the idiosyncratic terminology of the *Theoretische Biologie* (1928) essential to capturing the theoretical core of Uexküll's *Umweltlehre*?
- How much linguistic exactitude can be sacrificed to successfully reframe Uexküll in terms of biosemiotics?
- What role could the neutral non–species–specific terminology of MST play for the Uexküll translation project?
- Sebeok was convinced that Jakob von "Uexküll's seemingly arcane terminology is so advantageous, even when – or especially because – it provokes an often felt need to have recourse to an accompanying formal Glossary." (Sebeok 1982:83–87) What should this Glossary look like?
- How can the translator counteract a potentially biased evaluation of Uexküll's work (cf. Hoffmeyer, 2004:74) that influences her terminological choices?

Workshop participants include Paul Cobley, Donald Favareau, Jesper Hoffmeyer, Kalevi Kull, as well as any other interested conference participants.

Biological Cluster and Properties as Real Signs

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Do biological clusters really exist? If they do, they must be founded on biological properties. A biological property, or a combination of biological properties, *P*, which *identifies* a biological cluster, gives rise to the possibility of there being *real signs* in nature: every biological property that is identical, nomically connected, or even occasionally connected to *P* becomes now a potential and still *real* sign for the cluster itself or for any biological property typically instantiated by the members of the cluster. By using the term 'real' signs, we aim to mark our distance from a non-realist position. In a non-realist view all natural signs that (1) are not intentionally communicative and (2) are not shaped by natural evolution to work as functional signals, are not real signs, and are just interpreted as such by our mind. On the contrary, we want to argue that any sign standing for the biological cluster founded on *P*, or for any other biological property typically instantiated by the members of the cluster, is as objectively real as the cluster itself – though it needs an interpreter to be activated. We will wonder about what makes a biological cluster real, and we shall argue that it is a discontinuous difference in biological properties between the members and the non-members of the cluster.

We shall discuss this idea by means of analyzing the problem of classification in races and species, and we shall distinguish realist from non-realist definitions of race and species. We shall propose to look at the ontological problem about species and races through the lens of the philosophical debate about natural kinds, and we shall apply the important and provocative intuitions of Nelson Goodman, Saul Kripke, Hilary Putnam and David Lewis about natural kinds to biological clusters and the problem of their reality conditions.

Phytosemiosis in Orchids

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All life is based on signs, but nowhere more strikingly than in the Orchidaceae, the orchids, whose life cycle depends upon complex relations with fungal life, insects, birds, and of course, the semiotic animal, man. Linking Darwinian natural selection with scientific biosemiotic studies should yield a clearer picture of the evolutionary development of this most diverse of plant families, how it became so diverse, as well as its probable future.

From its inception as an embryo with no nourishment, needing to deceive the fungus it will ingest, to its reproduction by third parties through deception, the strategy of orchids is most strange but also explainable through a clear understanding of the signs it reads and gives. I propose to deal with some aspects of this group of 850 genera and over 35,000 species with the tools of phytosemiosis.

Key words: plant evolution, orchid, orchidaceae, RL Dressler, species, phytosemiotics, phytosemiosis, Charles Darwin, Batesian mimicry, mycology, pollinator

On the definition of meaning

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In the code model of semiosis, meaning is defined by coding, i.e., it is always the result of conventions, but many biosemioticians have regarded this idea as too simplistic. Their arguments can be divided into three groups: (1) meaning cannot be reduced to coding, because in that case living beings would be organic zombies that behave automatically according to prefixed rules; (2) there are many meanings of meaning and it is wrong to define it by any one process only; (3) meaning is produced not only by coding but by other mechanisms as well, in particular by the order-for-free processes described by Stuart Kauffman. All these objections, however, do not stand up to scrutiny.

(1) The fact that a code operates by the automatic application of its rules does not imply at all a loss of creativity. The rules of grammar and syntax of language, for example, are executed automatically every time that we speak and write, and yet it is precisely that automatism that allows us to create endlessly different combinations of words.

(2) It is true that there are many types of meanings, but this is because there are many types of codes, and in all cases it remains true that meaning is based on coding. There are three main types of semiosis in Nature (manufacturing, signalling and interpretive semiosis) and each of them can operate at many levels of organization. Manufacturing semiosis, for example, operates at the molecular level to produce proteins, but also at the mental level to produce entities like perceptions and feelings.

(3) The order-for-free processes described by Kauffman are a special type of phase-transitions that occur in complex systems, but they are not qualitatively different from ordinary phase-transitions like the solid-liquid or the liquid-gas transitions of water. Complex phase transitions describe the behaviour of complex physical systems such as hurricanes, but not the stages of embryonic development or other basic biological processes like protein synthesis, signal transduction and feelings. Phase-transitions in complex systems, in short, are purely physical processes and have nothing to do with *meaning*.

As far as we know, coding is the only mechanism that brings meaning into existence, and there is no point in saying that other mechanisms *must* exist simply because coding looks too simple. Coding, furthermore, is the only known mechanism that brings *absolute* novelties into existence, whereas copying generates only *relative* novelties by chance mutations of the copied entities. Coding is a fundamental mechanism of life, and this means that copying and coding are two distinct mechanisms of molecular change and that natural selection and natural conventions are two distinct mechanisms of evolution. The great contribution of semiosis to life is precisely the generation of absolute novelties, the origin of the great events of macroevolution, and they are all associated to new organic codes. Those who belittle the role of coding in semiosis should reflect on the fact that there are no other known mechanisms that produce meaning and that generate genuine novelties in the history of life.

How Can Simondon’s Relational Ontology Contribute to Biosemiotics?

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In our opinion, the conflicts and the lack of conciliation between cybernetics, information theory (IT) and Peircean semiotics (PS) has been plaguing biosemiotics since its inception and is a source of ongoing disagreement. In this paper we propose to consider these conflicts and possible reconciliations with the help of Gilbert Simondon’s relational ontology and his theory of individuation.

A possible way of explaining this unfortunate state of affairs is to ascribe the disagreements between these theories to their incommensurability (in the sense of Thomas Kuhn), i.e. to the fact that they relate to incompatible paradigms. Shannon’s theory of information (IT), as is well known, defines the concept of information independent of any notion of “meaning”, which is strongly related to embodiment and the functioning of complex hierarchical systems, particularly biological organisms. IT provides a quantitative measure of information -that is useful for technological communication applications- on cost of ignoring the ontological aspect of real systems, thus is not adequate for addressing living organisms. Cybernetic approaches, on the other hand, while trying to provide an ontogenetic account for the emergence of complex hierarchical systems, still exhibit a strongly reductionistic character that excludes the issue of meaning. Peirce, on the other hand, is very much concerned with “signification” (even more than Saussure with his addition of the “interpretant”) which is directly related to meaning. Yet his theory of signification was originally not formulated with biosemiotic concerns, and therefore does not include a discussion related to embodied interpreters with their multiple levels of hierarchical organisation.

A possible simple approach could have been to accept the incommensurability of these theories for a fact. Another alternative could be to seek a dialectic synthesis between them. Yet we propose a third alternative of evaluating them within a different framework that seeks potential complementarities and a new (non-dialectic) synthesis that could serve biosemiotic purposes much better.

In that respect, Simondon's relational ontology -with his notions like individuation, transduction, metastability etc. and his alternative interpretation of information- seems to provide a promising candidate framework capable of addressing the issues of signification and ontogenesis at the same time.

Key words: relational ontology, individuation, signification, Peircean semiotics, complex hierarchical systems

Living versus inanimate: the information border

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The traditional divide between nature and culture restricts to the latter the use of information. Biosemiotics claims instead that the divide between nature and culture is a mere subdivision within the living world but that semiosis is the specific feature which distinguishes the living from the inanimate. The present paper is intended to reformulate this basic tenet in information-theoretic terms, to support it using information-theoretic arguments, and to show that its consequences match reality. It first proposes a 'receiver-oriented' interpretation of semiosis. This interpretation implies that the means for recording, storing and processing information exclusively reside in the living world (extended so as to include the artefacts it produces). Then it may be argued that the main difference between the inanimate world and the living one lies in the fact that the very existence of the latter relies on information, which on the contrary is not relevant to the former. Thus, besides matter and energy, information is an entity irreducible to them which must be taken into account in any attempt for describing and understanding life. Information can interact with the real world only provided it is borne by some physical support: it must be 'physically inscribed'. Contrary to matter and energy, information can be shared, not necessarily exchanged, so a same information can be borne by a number of distinct supports. Any living thing possesses means for recording, storing and processing information which are necessary for keeping it alive and securing its progeny. In particular, its genome contains hereditary information, can be replicated, and instructs the construction and maintenance of a phenotype. The simultaneous existence of a phenotype and of a genome, where the latter bears the symbolic description of the former, is mandatory for enabling the self-reproduction of an organism. Bearing and using information then endows a living thing with the ability to decrease the physical entropy, hence to act as Maxwell's demon. Not only its own life is maintained against physical entropy, but its self-reproduction multiplies clones of the demon. Taking information as the entity which differentiates the living from the inanimate also supports Carlo Rovelli's 'relational' interpretation of quantum physics. Experimental apparatuses then appear as information-theoretic channels from the inanimate world to a living observer. Besides having its own perspective (as stated by Rovelli), each of these channels has its own horizon because its capacity is necessarily finite. As another consequence, we may assert that the physicists' quest of a 'theory of everything' is doomed to failure since, for lack of considering information as a relevant entity, physicists deny the living world, hence themselves.

Neuromorphic Asynchronous Images :
toward a new paradigm of image-based semiosis

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The semiosis operated between senses and the brain relies on spike impulsions as a vector to transfert information. Spikes allow a unification of biological signals, the impules emitted from sensors encode the information in a way to allow a bijective tranformation and ease the reconstruction of the perceived signals.

It seems that the brain uses half of its energy to fuel the generation of spikes to allow an exchange of information.

Brains are at least a million times more power-efficient than computers due to this natural codification of information that permits a more optimized computation. At the heart of the efficiency of biological systems lies the concept of asynchronous event-based communication. Most of the real neural networks work asynchronously and are event driven processes.

The presented work will enquire on the processes used to encode the visual information used by the retina cells by proposing a functional model using monitored data. The model will show that this codification allows a strong compression of information allowing a low transmission effort.

We will also show that the notion of visual information represetend by the nowadays classical "frame" is unknown in biological systems.

It seems that most of the interpretation of the acquired visual information are created within the brain. The presented vision paradigm may even let us wonder if the notion of an image really exists in the brain.

Finally we will inquire on the origin of such an optimized semiosis between senses and brains, giving possible pathways to determine the plasticity of such a process.

Metaphor comprehension in patient doctor interaction.
A biosemiotic perspective.

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Patients and doctors construct interactively a 'medical narrative' that must make sense in a bidimensional direction: the expression of illness experience and the shaping of a medical diagnosis which matches that experience as much as possible.
Of the verbal expressions available for linguistic analysis, metaphors come as one of the closest to the lived experience of illness. In that sense they can if properly interpreted contribute to a deepening of understanding between doctors and patients. Which in its turn can contribute to a better, individualised care.

Methods
Morris (1970) discerned three levels of semiotic analysis in conversations: syntax, semantics and pragmatics. The latter two are addressed here.
Transcripts of conversations between doctors and patients are analysed with the focus on the pragmatic aspect of metaphors: which conversational actions are facilitated by metaphor use in shaping the medical narrative, co-constructed by doctor and patient?
Conversations are recorded from complementary medical settings as complementary medicine often is said to deal with 'the whole patient', that is the person in its totality. Our focus is at their conversational strategies: do practitioners in complementary medicine utilize metaphors and formulations (summaries of previous sequences of information) in a semiotically relevant sense? That means: facilitating mutual comprehension of the whole illness experience? What are the conversational mechanisms for selecting data from the patient's illness story. Patient-doctor interaction is identified as one of the contextual factors contributing to clinical effects, so this is more than an academic question.

Results.
Next to the pragmatic use of metaphors as conversational instruments to reach certain aims, the types themselves of metaphors are analysed, that is at the semantic level.
Analogy in metaphor use between partners in a conversation may contribute to a better understanding.
Analogy between metaphors is defined in terms of Lakoff and Johnson's (1980) types of metaphors: spatial/orientational, ontological and structural.
The parallelism between *semantic* analogy in terms of use of metaphor types, and of *pragmatic* 'effect' is discussed.

Conclusion
Parallel analysis of metaphors at a *content* level (analogy in utilized types between conversational partners) and *conversation instrumental* level (use of metaphors for achieving conversational aims, may assist in clarifying participants' strategies to reconcile illness expression and diagnostic precision in interpretation.

Flexible models: on differentiation, systems and biosemiotics

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The focus of this research project stems from an interest in interdisciplinary research and the challenges that it brings about: the necessity of creating models which are flexible enough to be utilised in diverse research contexts and the relative *adaptation* and *translation* issues that this flexible approach to study necessitates.

The aim is to uncover the common features, or principles, that can be found in different measures in models of study. The objective is to underline the benefit that looking for analogy in models may bring about, which, as hypothesised, will consist in the hybridisation of research methods and experimentation.

The idea of analogy or isomorphism was first utilised by Bertalanffy (1968) to describe the common features that mathematical as well as social, psychological and biological models of reality present. His models such as organisation, closed and open systems, growth, differentiation and mechanisation, entropy and information, gather together a vast array of research in the sciences including information theory (Shannon and Weaver 1949) and cybernetics (Wiener 1961), and is at the very core of contemporary systems studies, ranging from sociology (Luhmann 1995) and semiotics (Lotman 2001), to biosemiotics (Sebeok 1979) and philosophy (Serres 2007).

This paper will focus on the systems theory principle of differentiation (and categorisation) with the intent to trace its history across different disciplines, including logic and discrete mathematics (i.e. logic of membership in set theory) and sociology (Luhmann's social systems), in order to provide a definition of the concept and explore how this model has been adapted to the reality it has attempted to study. Emphasis will be given to the adaptation of the principle of differentiation to biosemiotics, which implies notions of *cognition* – discrimination of information - and is a core factor in the emergence of the *semiotic self*, suggesting, as theorised by Sebeok, an immunologic, or biochemical, apprehension with semiotics overtones, and a semiotic, or social, apprehension, with biological anchoring (1991: 40).

A Natural Number System for Biosemiotic and Medical Signals

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Biosemiotics and biomedical practice are intimately intertwined concepts. In contrast to the regularity of physical philosophy, irregularities of relations dominate these practices. A logic for such irregularity, abstracted from the concept of electricity, will be described in this paper. An introduction to this formal sign system was recently published (Chandler, 2009). Relations of facts of living systems demand the creation of the unique individual from the regularities and irregularities of the particular. Natural relations of electrical particles generate the emergent semantic invariants necessary to meet these stringent syntactical requirements.

Manetti (1986) describes the ancient origins of semiotics as interpretation of signs developed within the medical and legal professions. C. S. Peirce (1839-1914), an American chemist and logician, categorized the relations between the sources, the symbols and the interpretations of signs and logical argumentation as a "trichotomy". Very roughly speaking, the logic of regularity and irregularity follows the Perceian operators. The number of logical categories may be any prime number, one, two, three, five, seven, and so forth (Chandler, unpublished, 2008).

Hoffmeyer (1996) describes biosemiosis within the context of molecular biology. While the exact nature of the evolutionary path from inorganic matter to the semiosphere is shrouded in uncertainties, it is widely agreed that the emergence of chemical codes is a common feature of all forms of life (Barbieri, 2006). Empirically, irregular codes of life are consequences of the irregularity of chemical codes themselves. A principal thesis of this work is that irregularity is a transitive concept that creates a sequence of logical invariances of increasing perplexity. At the source, the transitivity of these invariances is grounded in the electrical concepts of attraction, repulsion and size of units and integers. Irregularities of biological structures emerge from the order property of number and the irregularity of the logical operations on electrical particles - metabolism. A formal abstract number system, the perplex number system (PNS), was constructed from the sign system of chemistry. The necessary notion of order is empiric to the atomic numbers. The units and integers of the PNS are symbols for the electrical sizes of particles. Relations correspond to labeled bipartite graphs for both odd and even entities. All compositions preserve the antecedent parts in the emergent whole. Three basic logical operations are transpositions, synductions (meso-syllogisms) and retroduction. Synductions create irregular structures, part-by-part, step-by-step. A retroduction removes a particular part from the whole. Two sources of order are implicit to a biological structure, the electrical order of the perplex numbers and the logical order of the synductive (constructive) operations. Consequently, biological structures are composed from parts that are represented by conceptual regularity (of units and integers) as well as the conceptual irregularities; both classes of organization are integrated into the composition of life. Thus, bioinformatic irregularity is integral to nature.

The PNS meets the formal requirements for logical exactness and the self-reflexive criteria for biological reproduction; it represents biological invariances faithfully. The PNS includes special mathematical objects - meso-groups, meso-fields, patrices, patroids and labeled bipartite graphs, necessary for describing metabolism. A meso-group is similar to a space group of x-ray crystallography.

Empirically, medical practice demands a logic of both the irregular and of the particular for anatomy and physiology. Formally, PNS meets these requirements by a generative, synductive logic of preserving electricity parity; that is, units and integers with exact neutralization properties.

PNS, as an abstraction from nature itself, is ontologically prior to the real number system which is used to symbolize both quantum mechanics and thermodynamics.

Biosemiotic Praxis?
Modelling Systems Theory and Culture

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In contrast with semiologically-orientated semiotics, one criticism of biosemiotics has been that it does not offer a means to analyse the world of culture anew or the world in general. In short, there does not exist a biosemiotic praxis.

This paper proceeds from the argument that it is desirable to inculcate a biosemiotic praxis, a mode of understanding humans and their environment by means of an analytic apparatus which, in its application to the human Umwelt, is consistent with what is known about other Umwelten. The obstacle that has prevented the development of a wider biosemiotic framework for analysis has been that of *translation* (from one discipline to another as well as inter-semiotically). The problem of translation is possibly one of the most pressing ones on the biosemiotic agenda. Yet, in his last major original contribution, Thomas A. Sebeok had already started to clear the ground for a comprehensive and renewed semiotic vocabulary and a thoroughly biosemiotic analytic procedure. In *The Forms of Meaning* (with Marcel Danesi, 2000), he proposed a 'Systems Analysis' perspective arising from Modelling Systems Theory (MST), the latter itself a creative fusion of Peircean triadic thinking, Lotmanian analysis of culture, von Uexküll's Umwelt-forschung, aspects of cognitive semantics and, especially, cybernetics and systems theory. MST posits Primary Modelling Systems, identified as being based on the singular sign, especially icons. In turn, the iconic sign, with reference to Peirce, should be understood in relation to the qualisign. As such, signs are firmly rooted in qualia rather than simply in referential qualities. Secondary Modelling Systems, on the other hand, are "extensional" and based on the indexical sign. They are spatiotemporal in orientation. Then, Tertiary Modelling Systems are metaphorical and based on the symbol. Clearly, the analysis of movement between these different modelling systems indicates an attempt to understand the referential, linguistic feature of human communication in a much wider frame of modelling.

This paper will address the question of whether MST represents the hopes and desires for a biosemiotic praxis and tries to envisage how the latter might operate.

From biomechanisms to interpretation

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What the folk call 'language' integrates bodily dynamics with verbal aspects of what we hear (or see). How do events in biocultural time-scales contribute to language-activity? On a pico-scale (around 200msec), Marcello Barbieri's (2007) organic coding model is powerful. Elsewhere I document its relevance to *intrinsic motive formation,* how judgments of affect and meaning link experience to circumstances, and how we anticipate the sense of what we are about to read (Cowley, 2006, 2008; in press). This invites an objection. The sceptic will argue that human meaning-making is unlikely to depend on processes found in protein synthesis. The paper shows why organic coding can generate such hypotheses. Since protein synthesis *is* a biomechanism, it allows epistemological reduction. Unlike (say) computation or semiosis, it appeals to neither universal organization (e.g. input-output) nor an underlying pattern (e.g. a triad). In Bechtel's (2008) terms, organic coding is a *phenomenon* that functionally decomposes into *operations* that exploit *parts* and *modes of organization*. Beyond the cell, it exemplifies a biological mode of functioning. In agents that exploit different parts and modes of organization (e.g. organisms), adaptation may nonetheless use similar cycles of operations (e.g. 2nd messengers, transcription of a coding base, scanning by an adaptor, and synthesis of outcomes). The model's hypothesis generating power thus lies in viewing protein synthesis as a biosemiotic mechanism. Given evolution's slow dynamics, similar cycles may have come to shape action-perception. If so, observations about pico-scale language-dynamics are likely to link with biosemiotic hypotheses. Can the model scale up to lived events? For Abieva (2008), the cultural rise of off-line communication underpins verbal language. If so, it may also have changed how bodies (including brains) prompt infants to become *social actors* (Neumann & Cowley, in press). With tools and fetishes, manifest social judgments (by self and other) must be integrated with co-ordinated action. If events have display functions, individuals must orient to collective (and affective) *values*. Biosemiotic evaluation/ expression is well-placed to enact historically-based objects-with-valued-properties and events-of-valued-types. As a result, primate cognition would sensitise to local (or 'arbitrary') functions. Animals could enact interpretation based in shared judgements. However, this came about, there is no doubt that we orient to aspects or (historically based) judgements. As Tylen et al. (in press) show, social strategies serve in construing even strange images. Using circumstances –we draw on how others orient to *situations*. Given imagination, we inhabit a locally defined world of compulsive interpreters.

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Directions in Interpretative Biosemiotics

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Approximately since middle of 1990s interpretation tasks are considered to be the most important parts of biosemiotic researches. There are several significant works dedicated to this subject (Chebanov, 1993,1995, Witzany, 2006, 2007, Markos, 2002).

Each author has his own view on this problem, and their ideas have different backgrounds: A.Markos has ecological-physiological bias in his works, G.Witzany – mycological bias and S.Chebanov algological-lichenological one.

So now we have three fundamental currents of this subject.

How do they understand bio-hermeneutics?

For Markos, "everything that lives is hermeneutic in nature". The main objective of hermeneutic biology should be to get rid of genocentric view, that takes the genome as a recipe for building the body. It should pose question about the builder, who takes the genome as a mere dictionary of the language in which the recipe is written (cf. M.Barbieri's question "Who is creator of genetic code?).

Chebanov distinguishes bio-hermeneutics (interpretation processes in a living being) and the hermeneutics of biology (interpreting enlogue of sensible being with living being). The enlogue can be interpreted as quasi-dialogue taking place in quasipersonal situations when the participants have no such rational means of communication as, for instance, natural language.

As for Witzany, he doesn't use the term "bio-hermeneutics". Netherweless Witzany established the foundations of a three-leveled biosemiotics, i.e one in which any investigation or analyses of sign-mediated interactions must recognize the complementarity of syntactic, pragmatic and semantic rules.

About molecular Genetic Processes: Markos explore the possibility that molecular sequences might represent genuine written texts. He stimulates top-down analysis rather than more common bottom-up procedures.

Witzany detects analogies between "phenotypic, molecular functional language" and "phonetically based spoken languages". Protein alphabet can be compared with human language. The "words" of the protein language, the amino acid sequences, represent all the executive functions within organisms such as reaction mediation, control, and transport. Functionally operating symbols in protein languages are not merely rowed linearly but are "arranged according to their respective chemical task in a specific spatial coordination"

Chebanov says that we are dealing with a code, and relations between content and expression is not motivated.

Attitude to the evolution is interesting too: Markos: Evolution of the genetic text is neither cause of organismic evolution , nor its driving force.

Witzany: The evolution can be understood as the history of DNA chain growth. The evolution of all organisms in every kingdom represents a molecular evolution as well.

Chebanov: The evolution of genetic text has general proprieties of any evolution and has not any special crucial meaning.

Thus, we have three directions in biohermeneutics now.

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Generating signal transduction codes with an evolvable network representation of cells

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It has been argued that the signal transduction system of a living cell is a semiotic system. Here we present the design of a simulation system in which signal transduction codes can appear. This system allows to model and evaluate the operational procedures for studying the emergence and evolution of signal transduction codes.

To model the cell system we use a fixed metabolic network and an evolvable protein network. The metabolic network consists of a set of possible reactions that can be catalyzed by elements of the protein network. In addition, enzymes can be activated or deactivated by other enzymes or metabolites. Both networks are represented by differential equations that also determine the temporal behaviour. The networks are incorporated in a virtual cell that is situated in an artificial environment. Cells interact with the environment by nutrient uptake or enzyme activation dependent on the presence of molecule species. To move along a nutrient gradient cells are equipped with a motor. This motor can be activated by the cell.

Because the protein network is evolvable the enzyme activation matrix is evolvable too. An evolutionary algorithm is applied to evolve protein networks in a certain environmental setting. The fitness of individuals is evaluated intrinsically as biomass gain in the artificial environment.

The analysis of the evolution of the network and analysis of cell behaviour after optimization gives a deeper insight in how signal transductions codes are evolved and incorporated in a living cell. In future we want to extend this system to allow cells to communicate.

Cell-Matrix Adhesion Complexes and their Dynamic Assembly: The Poetics of Cell Migration Control

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Cell-matrix adhesion complexes (CMACs) are regions responsible for cellular attachment to the extracellular matrix (ECM) that are typically composed by integrins, α/β heterodimers that bind selectively different ECM components though their extracellular domains acting as receptors for this class of molecules. Upon ECM binding the cytoplasmic tails of integrins will interact with a wide range of recruited factors that regulate integrin clustering in the cell membrane ; and also activate signaling pathways that will provide a physical linkage between activated integrins and the microfilament system to be remodeled during cell migration. Ultimately CMACs work as functional protein networks that dynamically connect the ECM to filamentous Actin, controlling cell migration precisely through the continual rearrangement of both ECM adhesion and Actin polymerization. In the present work we shall examine some attempts to conceptualize “cell migration” as an emergent process present in the recent specialized literature; they introduce the notions of hierarchic organization into levels *i.e.* molecular, sub-cellular and cellular and describe an informational flow of increasing complexity *versus* decreasing number of entities, between these levels. We shall discuss few examples of CMACs remodeling in particular physiological and pathological conditions to argue that cell migration is a process which is also organized into semiotic dimensions. Our approach will not come as an alternative to the systems biology conceptualization initially presented but as a complementary view. Beyond the syntactic level – here illustrated as specific recognition of discrete ECM protein sequences by distinct integrin heterodimers – we shall reach the semantic and pragmatic levels by bringing into light the dynamics of some “word games”, *i.e.* Lewis Carroll’s doublets; and magic squares. In such poetic games the synthetic transformations subjected by the words have to deal with semantic rules, but are ultimately dictated by meaning, as concrete pragmatic constrains. We will emphasize the integration of synthetics, semantics and pragmatics also for the CMACs continuous remodeling through cell migration.

Towards a biologically-motivated approach to Meaning

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A life form and its environment constitute a unit, a “closed purposive organisation”, where the cognitive agent and the environmental bubble he is embedded in are bound by a relation of mutual dependence and influence. In this microcosm semiosis takes place.

Semiosis is present in all forms of cognition, it’s inherent to life itself. As cognition it is embodied-determined by the physical architecture of the agent; embedded-it develops in specific environmental nutshells; situated-it takes place in particular circumstances.

As Peirce we distinguish two levels of semiotic structuring: a basic level, comprehending the semiotic relations that involve a stimulus-response relationship, which is dyadic in nature, and those that are triadic, because they are symbolically encoded.

However, in all instances of semiotic structuring, either those involving dyadic or triadic relationships, there is always the presence of a life form that evolves in an environment and that has “expectations” relatively to the kind of information it is going to be able to find and retrieve from this same environment. As a consequence of these “expectations”, some of the environmental features emerge and become salient for that entity.

Either dyadic or triadic relationships involve a process of interpretation that results in the recognition of something as meaningful. Meaning depends on acts of “interpretation” carried out by specific cognitive agents.

Biosemiotics provides an integrated approach that allows identifying the essential pattern present both in basic semiosis and in the upper levels of semiotic structuring, simultaneously highlighting the very nature of Meaning.

Biosemiotics and the Relational Turn in Biology

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This contribution attempts to synthesize and expand ideas previously presented at these meetings by placing them into a wider framework at the intersection of biosemiotics and current philosophy of biology. In those previous investigations I aimed mainly at exploring the connections between two special kinds of relational structures: the networks of self-referential circular loops that appear pervasively in living systems, and the triadic relational structures that Peircean semiotics envisions as the basis of all semiotic transactions.

On the present occasion I attempt to place these concerns within a wider set of emerging ideas which have been recently brought together through some new and concurrent tendencies in separate areas of biology and the philosophy of science. For lack of a better expression I characterize these partially overlapping trends as the outcomes of a “relational turn” in these disciplines. Indeed, one of the salient connecting commonalities among these developments is a shift of attention away from objects and things and towards relational structures and processes, both as the central targets of experimental research and as the principal conceptual vehicles for explanatory modeling and theorizing.

In the biological sciences relational approaches have been newly motivated by the need to discern simpler patterns within the enormous accumulation of experimental data generated by the increasingly sophisticated research technologies of molecular biology. Earlier conceptions of relational biology and cybernetics, once deemed too abstract and speculative to make contact with experimental praxis, are now being resurrected and applied through the application of methods made possible by current computational, modeling and simulation tools.

With this in mind I briefly review aspects of systems biology, synthetic biology and some new directions in evolutionary theory, such as epigenetic inheritance, niche construction and ecological engineering, focusing on the role of circular, downward and reciprocal causation in the constitution of relational structures and dynamical circuits or networks.

Finally, I explore possible avenues of integration and conceptual cooperation between ideas and goals in biosemiotics and those seen to be emerging from the examined new currents in biology. For this purpose I sketch the main features of a parallel relational turn presently manifest in the philosophy of science, with roots in the philosophy of physics and mathematics. This relational turn is a main, explicit tenet of different varieties of structural or relational realism and of informational realism. I attempt to assess the potential of this type of philosophical platform for the integration of biosemiotics with the rest of biology and with natural philosophy in general, across disciplinary boundaries.

Receptor Oligomerization as a Mechanism controlling Cellular Semiotics

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It has been widely demonstrated that the majority of the G protein-coupled receptors (GPCRs) become functionally active only if self-assembled in the form dimeric/oligomeric complexes along the plasma membrane. Due to the variety of molecular interactions they participate, GPCRs can potentially provide the framework for discriminating a wide variety of intercellular signals, as based on some kind of combinatorial receptor codes. GPCRs can in fact transduce signals from the external milieu by modifying the activity of such intracellular proteins as adenylyl cyclases, phospholipases and ion channels via interactions with specific G-proteins. However, in spite of the variety of cell functions they can actually control, both GPCRs and their associated signal transduction pathways are extremely well conserved, for only a few alleles with null or minor functional alterations have so far been found. This would seem to suggest that, beside a mechanism for DNA repairing, there must be another level of quality control that may help maintaining GPCRs rather stable throughout evolution. We propose here receptor oligomerization to be a basic molecular mechanism controlling GPCRs redundancy in many different cell types and the plasma membrane as the first hierarchical cell structure at which selective categorical sensing may occur. Categorical sensing can be seen as the cellular capacity for identifying and ordering complex patterns of mixed signals out of a contextual matrix, i.e., the recognition of meaningful patterns out of ubiquitous signals. In this context, redundancy and degeneracy may appear as the required features to integrate the cell system into a functional unit pertaining to a higher hierarchical level.

In this study, we intend to evaluate the feasibility of this proposal by examining a number of instances in which receptor oligomerization has been found to play crucial roles for signal transduction and cell differentiation. In addition, we propose two different experimental approaches in *Drosophila* embryos that should in principle allow us to verify whether GPCRs oligomerization may indeed control genome redundancy and protein mutagenesis. The first aims at establishing whether a dominant negative allele of a GPCR may suppress the expression of the corresponding wild type receptor by oligomerization in early embryos. The second aims instead at verifying whether an incorrect pairing between two wild type receptors or misfolding of one of the two allelic proteins may likewise affect proceeding of the embryonic development in *Drosophila*. We do firmly believe that the theoretical elaboration of this proposal along with its experimental verification may provide us with a logical framework to understand how a cell may eventually accomplish its role as a semiotic system and, at the same time, how genes are to be understood as bearers of information. In our view, genes should be understood as bearers of the necessary code for specifying their correspondence with functional protein domains, rather than factors playing a causal role to produce the relevant phenotypes. Once integrated into the plasma membrane, these domains should then act as sensors to recognize complex signalling patterns by virtue of their redundant monomeric constituents. If only differential gene expression were to count for development, then the organism would necessarily be conceived as being fully pre-determined by its genotype. On the contrary, by proposing the plasma membrane as a selective threshold constraining receptor redundancy, we may eventually come to conceive developing embryos as epigenetic systems gradually emerging through recursive interactions between their expressed genes and the resulting cellular events.

All Over the Map:
Heterarchical Topology
for Bateson's Context and Meta-Context

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Heterarchy depicts a mapping of levels intended to correct classic attributions of 'hierarchy' in multi-level organic order. Essentially it depicts an all-over-the mapness of events. In the1940s Warren McCulloch's raised the notion of heterarchy in association with the "dromes" of neural pathways; later von Foerster discussed it with regard neural and endocrine interaction and sensorimotor pathways; von Foerster recognized that only one topology, itself heterarchical in form, can model heterarchy - that is a torus. Bateson discussed heterarchy with regard to value-anomaly -how choices in circular interactive nets (McCulloch's "dromes) are context determined and time dependent and not hierarchically ordered. More recently Bruni has discussed heterarchy with regard to categorical perception (*Biosemiotics,* 2008. Vol 1:114ff.). Yet the sequence of context, meta-context, meta-meta-context which Bateson deems necessary for understanding pattern in multi-level informational orders has proven difficult to model. This presentation introduces Don McNeil's visual elaboration of toroidal forms. His toroids are a co-volutionary ordering of a circular ordering. They are composite wholes defined by mutual complementarity, for example in any torus its *meridia*l cyclical orderings alter the parameters of *annular* cyclical orderings. Toroidal ordering of heterarchies emphasize flow or process in a particular manner, that of recursion and repetition always subject to continual change. Cycles of change are organized to compensate continually, so that the dynamic stability of any heterarchy is that of "relative invariance." McNeil notes that any toroid topology always remains that of a composite whole, in contrast to the usual partitioning undertaken in the western rational tradition and then depicted through reductionist topologies of projective cones, planes, or spheres. He suggest toroidal heterarchy should have relevance to visual depiction of two other Bateson concepts: analogue-digital coding and morphogenetic 'scaffolding' of part and whole (cf. Hoffmeyer).

Umwelträume and Multi-Sensory Integration

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It is known how Uexküll realized – and, most importantly, argued conclusively for – the fact that biological variations result in varied life experiences. The capability of a creature to discern qualities in the world with which it entertains meaningful relationships determines the variability of these experiences. Uexküll developed a manifestly semiotic ontology. By looking at actions, we infer what kind of experiences the creature is having; or by describing the meaningful relationships in which a creature is engaged, one also describes the creature itself. What Uexküll uniquely insisted on, was the idea that these combined experiences make up places. Living distinct experiences, a creature lives in its proper world, which Uexküll called *Umwelt*.

An *Umwelt*, and the experiences that manifest it, is the result of an amalgam of information percolated through different senses, each of them being receptive to certain qualities of a certain range. Our experiences are indeed the conjunction or the result of cross-referenced facts. This is what neurosciences designate by cross-modal processing or multi-sensory integration, terms that describe the manner by which different information of varied origins is assembled into a (somewhat) unified experience. Experiences are in fact a composite of information that can be abstracted from each other; one can, for example, describe the pale yellow colour of a wine (visual experience) without mentioning its apple-like taste (flavour experience). Yet when these qualities are put together, one might recognize a certain type white wine.

If the experience that constitutes place can be broken down into a multiplicity of distinct experiences, the place that experience brings forth can, in turn, be multiplied. Since a creature can have many experiences of varied types, it is, in a way, at the intersection of various places. This hypothesis, I argue, has been examined by Uexküll himself in a relatively unrecognised chapter « Die Umwelträume » (1956, 30-42). The plural – *räume* (room, area) is crucial, since Uexküll argues for the idea that an *Umwelt* is at the intersection of three experientially distinct places: active, tactile and visual. I propose to explore Uexküll's multiplication of places as a predecessor to the idea of cross-modality, as well as certain implications this may have on place-centered philosophy.

On consortia, umwelten, and biophony (and the ecological codes)

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The paper focuses on the semiotic principles of organisation of ecosystems.

Consortium is a term introduced into ecology evidently by Johannes Reinke around 1873, and can be defined as a group of organisms connected via (sign) relations. The concept was first applied to describe the relations between plants and soil fungi, and also algae and fungi as in case of lichens. Later, consortia were seen as the general functional components (units) of biocoenosis, being defined as the associations between an edificator and its epibionts and endobionts (V. Beklemishev, L. Ramenski, T. Rabotnov, V. Masing). The contemporary usage of the term is frequent in soil microbiology, marking the functionally related groups of species. The relations involved in a consortium are both trophic and topic — in any case, these relations assume a recognition (identification) of the object by an organism involved (which means these are sign relations). Accordingly – consortia are the groups of semiosic links in biocoenosis as related to a particular species. These links (relations) are *ecologically inheritable* — in order to become inherited (conveyed from one generation to a next), a relation requires all of its relata, one is not enough.

Umwelt is a term introduced into biology by Jakob von Uexküll around 1909, and can be defined as a set of relations an organism has in an ecosystem (as in a semiosphere). The formation of an umwelt is dependent on the *Innenwelt* as the modelling system of the organism.

Biophony is a term that has been introduced (by B. Krause around 2000) to describe the relations (both inter-species and intra-species) in a soundscape of biological community. This can be seen as a special case of the concept of *Komposition* as used by Jakob and Thure von Uexküll.

Ecological code (as introduced for instance by A. Levich around 1977) can be defined as the set of (sign) relations (regular irreducible correspondences) characteristic to entire ecosystem.

If the relations (as the term is used above) are all sign-relations, then it is evident that these imply both a static or structuralist description (in terms of codes), and a processual description (in terms of semiosis carried on — or inherited — by interpretation).

Thus we may conclude that consortium, umwelt, and biophony — as well as ecological code — are the concepts that are inherently connected and can be used in a semiotic description of biological communities.

Ape Pointing: A Case Study in Distributed Cognition

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Classic, information-theoretic (IT) approaches to communicative interaction entail a commitment to a prior message, which is encoded, transmitted with some degree of fidelity between agents, and decoded. The bridging of the epistemological chasm between agents requires a common code. The genesis of this common code is a matter of some considerable contemporary debate. The IT model has been energetically applied to early nonverbal communication in humans (*Homo sapiens*)—babies point, according to contemporary dogma, because they want to influence the contents of others' minds. In the IT perspective, babies bridge the epistemological chasm between separate "minds" because our evolutionary histories selected for a computational or representational neural architecture that facilitates either (a) the inference of a particular mental process model in the face of an underspecified environmental input (poverty of the stimulus) or (b) extrapolate their dawning, first-person awareness of their own mental processing to other agents. This biologically adaptive history that is allegedly unique to our species is, thus, the source for the common code. Historically, particularly in ethological research, there has been an emphasis on information transmission, with questions of meaning and its construction either postponed or attributed to natural selection.

Recently, IT approaches to early human nonverbal communication have come under heavy fire from proponents of alternative process models, including emerging dialogues under the rubrics of embodied cognition, distributed cognition, enactive cognition, dynamic systems theory, and others. In our work with captive chimpanzees (*Pan troglodytes*), over the last 15 years, we find that these animals display numerous species-atypical visual and auditory signals, of which pointing is the most-studied example.

In this talk, we will summarise recent research on ape-human communicative interactions in our laboratory and others, and findings from wild ape populations, to demonstrate that chimpanzees, our nearest living relatives, display extraordinary flexibility in their signalling repertoires, in accordance with the physical and social attributes of their specific ecological circumstances. This pattern of "cultural" variation in communicative conventions certainly evokes comparisons with human cross-cultural variation in non-verbal signalling. This is of relevance to questions of the source of shared "frames" or common codes in our own and related species. Pointing, itself, was long considered to be a human species-specific biologically based communicative gesture, but recent findings refute this claim. Apes point in ecological circumstances that mimic certain systemic attributes of the learning environments of human babies: specifically, restraints on free movement and extended reliance upon provisioning by caregivers engender a specific ecological structure we term the Referential Problem Space. Thus, in pointing we find a confluent influence of evolutionary histories, individual learning histories, and ecological circumstances. This research was originally conceived and conducted under the IT theoretical regime and represents, therefore, an inductive approach to transcending the conceptual gulf between "information" and "meaning."

How To Make Sense of Animal Complex Semiotic Activities?

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I shall propose a new *bi-constructivist paradigm* for ethology (a constructivist ethology for which each animal itself follows constructivist strategies) and I shall discuss the implication of such an approach for our human ability to make sense of what animals do when they are involved in complexe semiotic *activities* – such like drawings, dancing or singing. The starting point of that approach lies in the passage from the classical aistotelician question (What is an animal?) to a more Spinozist one (What can an animals do?). Could it be possible to conceptualize an ethology that will insist upon interpretation and therefore innovation and creativity more than upon straight causalities, routine procedures monotony and environmental or genetic determinations? An ethology that will not be rooted on the fiction of a inexistent observer but that will fully assume the necessity that an observer must be present for having an observation ? A pluralist ethology that will not push away, far away, minority epistemologies of practitioners of animals (trainers, hunters, fishermen, etc.) and of non western experts ? An ethology that will not restrict itself to purely academic epistemologies, almost only obsessed by the drawings of strong basic frontiers between humans and (other) animals?

Context-dependent meaning in plants: a model for non-animal semiosis

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Biosemiotics seeks models and explanations relevant to sign, signal and information processing in biological systems. However, conventional models used to study information-related phenomena, including semiosis, often suffer by being "too close to ourselves". Animals share much of our evolutionary history and tempt us to view them as "almost human", while disembodied virtual theoretical models – be it Peircean trigonometry, computer-generated models, or "molecular logical circuits" provided by molecular biology – tend to shift the focus from the phenomena that are being modeled to the acts and activities of the human authors/creators of such models.

Plants may provide a macroscopic, experimentally accessible, non-animal and natural alternative model (an outgroup in terms of evolutionary biology), opening a way towards identification of processes and principles shared by very distant evolutionary lineages and thus probably common to all living beings. We shall illustrate that *memory* and *context-dependent meaning* may belong among such truly general principles of biological semiosis, using the example of multiple meanings of sugars (saccharides) in the life of a multicellular flowering plant, such as, e.g. the model weed *Arabidopsis thaliana*.

One of the most serious tasks of plant life is achieving balance, over a wide range of environmental conditions, between carbon assimilation in source photosynthetic tissues (sugar production in leaves and other green above-ground organs), and consumption of assimilates in sink tissues and organs (i.e. tissues and organs that either do not perform photosynthesis, or produce less assimilates than they consume, such as roots, flowers, ripening seeds or young developing leaves). To reach such a balance, the plant must record, store, access and evaluate information on long-term state of its metabolism, including but not limited to photosynthesis. A necessary prerequisite is thus the existence of some kind of accessible memory, and an ability to evaluate information retrieved from the memory in the context of previous experience (such as the history of, e.g., availability of nutrients, or light quality and quantity).

We shall review experimental evidence that saccharides not only serve as nutrients and osmotica, but they are also sensed and generate signals orchestrating complex regulation of carbon assimilation, assimilate storage and consumption. As a rather significant example, the diurnal rhythm of photosynthesis brings the need to put aside a part of assimilates during the day to support steady metabolism and growth during the night. Remarkably, the plant adjusts the rate of utilization of these stored reserves so that they last for the *whole* night. Moreover, the modulation of the saccharide allocation patterns reflects environmental changes, indicating memory of previous experience.

Although the involved regulatory mechanisms are only beginning to be understood, it is already clear that sugars play a role of specific signals, or signs representing the current state and recent history of relevant variables from the vast sea of parameters of the environmental and intrinsic conditions the plant is constantly facing.

The semiotic threshold and the threshold of life

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The problem of the relation between sign processes and life processes should be refined. Both semiosis and life can be treated in the perspective of means-purpose relationship constituting hierarchies. Both semiosis and life will appear in levels the whole of which constitutes the universe of life, or alternatively put, an overall semiotic web. However, for truncated collections of levels there is no clear answer whether the threshold has been overstepped. While there is a hierarchy of life, how can means of life excluded from life? This question arises both for the physical and chemical prerequisites of life and complex human artifacts.

Neuronal *versus* Relational Man
Epistemological and Semiotic Approach

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> "The theme (…) is that the individual human mind is not confined within the head, but extends throughout the living body and includes the world beyond the biological membrane of the organism, especially the interpersonal, social world of self and other" (Evan THOMPSON (2001). "Empathy and Consciousness". In Evan THOMPSON (Ed.), *Between Ourselves: Second-Person Issues in the Study of Consciousness.* Thorverton, UK: Imprint Academic, p. 2).

The aristotelian-tomist tradition and the perspective of the modernity, especially the cognitive sciences, introduces the human being as an autonomous and rational being rather than a relational one (MAJOR, 2005). In fact, many cognitive scientists describe the life in terms of chemistry and physics, and the human mind in terms of neurons and how they work. We consider this to be a serious flaw to a correct perception of the human being. In this talk, we will discuss the human person's relational character: the so called second-person perspective (BUBER, 1970) (different from the first-person perspective, the introspection perspective, and from the third-person perspective, the scientific perspective). According to the second-person perspective the "I" is not dissociable from the relationship with the "you", and both define themselves through the relation (THOMPSON, 2001). None of them can subsist out of it (DINIS, 2007). The demonstration that a relational concept can be used in psychology enriches the description that the contemporary sciences do of the human being.

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Semiotic Selection, Cooption, and Good Old Darwin: Is There a Common Basis for the Explanation of Mimicry, Sexual Selection, and Domestication?

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This year we have Charles Darwin's dual anniversary at once: the anniversary of his biological as well as academic *Origin* (1809, 1859). Perhaps nobody has so many times been celebrated, blessed and ideologically abused by different scientific, political, and cultural movements as the humble father of evolutionary theory. For instance Thomas Huxley used/misused Darwin's ideas for his own view of directed evolution, Ernst Haeckel for his phylogenetic idealism, early Synthetic Darwinists for introducing genetics into evolutionary study, and Evolutionary Synthesis for creating a new layer of strange interpretations. In playing with Darwin's favorites toys we are no exception. No matter what the attitude of contemporary biosemiotics towards Darwinism, one must accept that Darwin's works are a generous source of inspiration.

In this paper, we focus on Darwin's topics of sexual selection, domestication, and add mimicry in order to reveal their common underlying theoretical basis. We argue that these phenomena are critically dependent on the peculiarities of Umwelt of a particular animal interpreter (selector). Therefore the term *semiotic selection* has been proposed (Maran 2008: 177) to embrace not only the cases generated by sexual selection, but every phenomena where subject-specific interpretation comes into action. Semiotic selection operates thought perception, interpretation and feedback, being thus the derivative of Uexküll's "Funktionkreis" (Uexküll 1982: 31). We see a fundamental difference between semiotic selection and natural or physical selection. Whereas in natural selection environmental conditions are embedded into organisms, in semiotic selection the properties of the "selector's" inner world are implemented to the perceivable properties of other animals and physical environment. Kalevi Kull (1998) has emphasized the role of human linguistic and interpretational activity in changing natural our environment through actions. We extend this principle of semiosically charged change to all living organisms that have an Umwelt.

The concept of semiotic selection thus involves both Umwelt-specific interpretation (semiotic cooption) and further selection of a meaningful signal. Thus we do not consider semiotic selection as a single type of events but rather as a scale of phenomena dependent on the type and closeness of the relations between organisms (interdigitation of Umwelten). Besides specific correspondences that are extensively described by Neo-Darwinian biology (handicap hypothesis), there are also more general and subtle propensities to meet the perception and interpretation (e.g. Portmannian self-representation, Portmann 1960: 102f; Kleisner 2008). Uniting in a common theoretical frame the phenomena of mimicry, domestication and sexual selection that traditionally have been viewed separately enables us to better understand the origin, transmission, and evolution of phenotypic similarity.

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Towards Darwinian biosemiotics

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The Darwinian theory of evolution stood in a direct antithesis to rational models of knowledge held in his time, be it science, theology, economy, or historiography. Darwin showed that evolution is an historical and divergent process, that will reveal some consistent trends only *ex post*, but nothing can be presaged in advance. All turmoil and heated discussions in last 150 years was oriented towards eliminating the discrepancy. Adoption of Darwin by science was – in different versions of neoDarwinism – accompanied by suppressing the historical part of the teaching and defining some basic level of description which behaves fully deterministically as required by science. Evolution is, then, a "function of malfunctions" that occur on this very level; all other levels of a living being but epiphenomena of the basic level.

Darwin, however, did not know any basic level of description, he worked with living beings as such. They exert their *fitness* in endless games and negotiations, to *fit* into the ecosystem of mutual relationships. Here experience, learning, cheating, i.e. semiotic processes come into play.

Some biosemioticians take for the founding father of our science J. von Uexküll, who denied evolution and put emphasis on predetermined order in living nature. Another founding father is recognized in C.S. Peirce; one of closest friends of Peirce, C. Wright, was in close contact with Darwin and developed his teaching philosophically. I shall argue that Darwin deserves to be also added to the Pantheon of founding fathers of our science.

The basic question remains: can, and should evolution, language, semiotics become part of normal natural science, or should they accompany biology, to provide deeper, and more consistent, knowledge of life?

The semiotic construction of social reality

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In this talk arguments from biology and theory of language will be used to suggest how biosemiotics contributes to the self-production of social reality. It is argued that social reality can be identified in the self-production of the human actor. The talk will be structured in three parts. First an outline of the sociological argument will be given. Then it will be argued that the human actor is dependent on the distributed nature of language. Finally, it will be examined how this depends on biosemiotic conditions.

a) The sociological argument

The talk reconsiders individualist and collectivist approaches to sociological explanation. Rejecting the dichotomy, it bridges the micro-macro gap by linking human development with sociological explanation. A distinctive feature of human actors is the capacity for rational deliberation. However, as we self-produce reason, we reproduce the social. Rationality, it is argued, is grounded in how language shapes the development of biological humans. Language acquisition is the mechanism of the reproduction of the social level of reality (Neumann & Cowley submitted).

b) a theory of language

Actor rationality depends on manipulating abstract symbols. This is inseparable from language. Like actions, however, language is anything but *disembodied*. It will be argued that language acquisition is dependent on real-time activity. Unlike a code, real-time language connects living bodies (Maturana 1978). Social embedding thus permits the human symbol grounding that makes us into rational actors. Although having a verbal (and symbolic) aspect, language connects dynamics, activity and cultural experience. Following Wittgenstein (1958), *agreements in judgement* connect words, circumstances with the music of expression. Rationality is made possible by language, which is intrinsically social.

c) biosemiotics

The capability of languaging is grounded in biological conditions (Barbieri 2008). Human symbol grounding (Cowley 2007) is a distinctive feature of the human species that co-evolved together with human developmental patterns. It is a biological fact that, while our close relatives have three developmental phases, we have two more (Locke and Bogin 2006). This is the precondition for the neuro-physiological development that allows for rational deliberation. Infants become human actors, in part, by learning to use living bodies in learning to co-act and shape affect (Dumouchel 2006). Above all, they learn to make sense of how talk shapes activity. Social reality is inherent in the emergence of the embodied and socially embedded human actor (Emmeche 1999).

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The Barnacle and the Whale:
a Fable of Semiotic Explanation.

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This paper will comprise of an investigation into the zoosemiotic relations between a small invertebrate (a whale barnacle) and a large vertebrate (a whale), and will pay especial attention to the problem of the so-called "semiotic gap" in explanations of representation (from signal to sign & sign to symbol). The paper will build upon a model of hierarchical general representation. How is information processed in a commensalist relationship, one that involves two parties which are morphologically so different? The paper will examine in a comparative manner the difficulty of describing and locating semiotic production in these animals' behaviours and neurophysiological processes. In the course of doing so, the paper will tease out theoretical implications regarding enriched information theory (EIT) that arise from the study.

Keywords: zoosemiotic relations, hierarchical general representation, neuroscience, ethology, commensalism, enriched information theory (EIT).

Reading bacterial messages

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Not only so-called higher Eucarya are able to form multicellular bodies – it is clear now, that lower Eucarya and even bacteria are able to do so. The sophisticated and non-trivial ways of forming colonies and their interactions demand a developed communication apparatus. Communication mechanisms are well-described for various bacterial species e.g. in papers of Ben-Jacob and Shapiro, for yeast e.g. in papers of Palková.
We observed two levels of communication in bacteria S*erratia* sp.: First one functioning inside a single bacterial body (hormone-like signal), the second between two or more bacterial bodies (pheromone-like signal).
The first case includes differentiation instructions for cells in colony, to be able to cooperate on significant, clone-specific morphotype. Such a morphotype does not depend on whether a colony was started from a single cell or from a mass containing millions of them (the second case requiring sophisticated cooperation from the very beginning).
We describe ability of a colony to act as a single individuum by delimitating itself from other colonies at one hand, and ability to co-operate in order to form confluent colonies (“concols”) at the other.
The second case includes signaling between bacterial bodies. Due to the ability of this signal to linger on medium even after removing its source (i.e. colonies), we rather call it *sign* than signal (the effect is not caused by mere nutrient depletion). Such an “I am here” sign will influence behavior of newly starting colonies, even if the message was produced by a different bacterial species. This leads in some cases to accelerate entering into later stages of body development, or to a slowdown, even complete standstill of the colony development.
Our results suggest that *Serratia* bodies are able to learn their environment, adjust their behaviour according to it and actively form both.

Elaborating a new methodology for avian soundscape analysis

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Soundscape can be defined "*a landscape captured not with eyes but with ears, which tries to portray the states of regional societies, cultures, and consciousness through the medium of sound*". Although poorly explored by ecological sciences, the study of the soundscape represents an interesting field of the eco-semiotic and cognitive researches. This largely depends on the great mass of information received from sounds, coupled with the difficulty to find out efficient indexes able to interpret audio-registration data.

New hypotheses were advanced investigating the soundscape of a bird community living in a beech grove located faraway from human activities (Cerreto Laghi, Tuscany, Italy). In particular, our aim was to elaborate and to evaluate a new methodology to extract information from audio-data able to characterize eco-semiotic interactions inside a bird community. Accordingly, twenty audio-recordings were set in an array (500mx400m) for 11 days of registration. The audio-files were synchronized obtaining 2 hours of net usable files. The total number and classification of birds' vocalizations, the frequency classes recurrence in birds singing activity, birds' songs intensity (decibels), the "Information Index" proposed by Farina & Morri (2008) and the relationship between birds songs distribution and the vegetation coverage were extracted by using Songscope v2.1 e Avisoft v4.40 software.

The behaviour of these parameters allowed to conclude that: classifying birds' vocalizations provides the distribution of a species during song activity; the frequency classes recurrence and the intensity values seemed to be good indicators to evaluate the evolution of the birds' soundscape in time and space; the "Information Index" did not show significant correlations with the number of vocalizations, frequencies and decibels analysis as well; the amount of vegetation coverage did not seem to be related to birds' acoustic activity.

The analysis of birds' songs and their eco-semiotic interrelations could bring new interpretations of the community coalescence and represent an interesting tool in monitoring the complexity of the environment, although methods and techniques are still in a transitional face.

Link between common YES-MAYBE-NO head gestures and directional properties of human vestibular system

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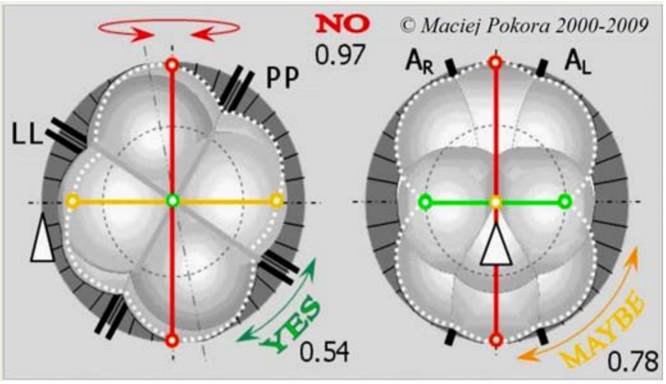
Introduction. According to paleontologists and evolutionists our skills were optimized once ancestors could develop brain faster due to use of tools after maintaining body balance which set hands free. Our 6th sense - balance - contributed to us becoming humans by unconscious support to development, orientation, standing, transfer, work, safety, relax, reading, and communication.

Method. *Combined Rotational Exposure* modeling (*CREx*) is based on hypothesis that different head rotation axes have different sensitivities. This suggestion is founded on specific orientation of semicircular canals, and its apparently more selective sensing of head rotational accelerations comparing to the otoliths, vision, touch and proprioception. In *CREx* approach the head is treated as cut-off free ball which can be set in oscillatory rotations at any direction, with no restraints to trunk nor Earth. Due to Occam razor principle the *CREx* equals a sum of 6 relative measures of elementary signals from all 6 canals which are treated as full, equal circles of equal conditions of endolymph flow. Elementary exposure of any given canal is assumed to be proportional to | *cosine* | of the angle between perpendicular line to the canal's plane and the actual axis of head rotation around its center. Thus the relative measure of elementary canal exposure equals the length of the shorter axis "b" of an ellipse - as each canal is seen from direction defined by instant vector of head rotation. All 3 pairs of semicircular canals: anterior A_R A_L, lateral L L, posterior P P, and the resulting *CREx* graphs are projected onto the center point of the head. Exemplary exposure of the posterior canal is:

$$b_P = 1 - 0{,}5 * (\cos\lambda - \cos\alpha_P)^2 + 0{,}5 * (\sin\lambda + |\cos\gamma| * \sin\alpha_P)^2 + 0{,}5 * \sin^2\alpha_P * \sin^2\gamma$$

where: α_P inclination of posterior canal
λ, γ vertical/horizontal orientation of instant rotation vector in skull-fixed coordinates
$CREx = k * (bA_R + bA_L + 2 * b_L + 2 * b_P)$; $k = 0.29$ to standardize $CREx_{max} = 1$
$CREx_{min} = 0.54$; $CREx_{mean} = 0.86$

Results. In polar 3D coordinates the *cosine* is represented by twin-sphere, hence the resulting total graph is composed of 12 symmetrically inter-submerged spheres. Shown are sagittal and frontal views of *CREx*. Relation between graduation of non-verbal head gestures is linked to anatomy. Expressed by head oscillations common signs **YES MAYBE NO** orderly relate to corresponding values **0.5** : **0.8** : **1** of *CREx*. Sub-maximal exposure while rotating the head around its vertical axis may relate to principal demand of safety: to survive in disagreement (**NO**) one has to be accurate and fast in surround scanning to watch potential attack of the enemy. In opposite situation, while nodding (**YES**) the canals are exposed to all-minimum combined vestibular stimuli. Negotiable **MAYBE** is linked to intermediate *CREx* value 0.5<**0.8**<1.



Conclusions. Modeling suggests important biosemiotic role of human vestibule for our cultural development. My hypothesis is that negation has preserved an evolutionarily advantageous reflex in our ancestors to prudently scan the situation left and right - an action that itself eventually became a non-verbal synonym for word "**NO**". However, local differences in head expressions in Bulgaria and Greece seem to confirm that there is no rule without an exception.

A Derridean Approach to the Biosemiotic problem

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While the central premise of the biosemiotic approach is that living nature is basically semiotic, this premise is often understood to mean that life is a language-like system. From this premise, most theorists go on to ask whether a semiotics of living systems is a good metaphor, and if not, what it would take to transform it into a good metaphor.

In this paper, I want to pose an entirely different kind of question, one that is unfortunately seldom asked by biosemiotics as a field: what must semiotics be in order that it can represent living systems? If life is language-like, then the understanding of language that biosemiotics employs to make its accounts work is a rather narrow one indeed. It is often marked for example, by a preference for one kind of language (human, natural, written) over another (non-human, artificial, spoken). But it also and quite significantly rests on the rupture between language as merely a kind of semiotic system and a more originary and overarching semiosis of which language is evolutionary inevitability. Semiosis therefore becomes a kind of organising principle that promises to ally anxieties over the emergence and evolution of living systems, and yet rarely is this organising principle submitted to close scrutiny.

Drawing on the work of both C.S. Peirce and Jacques Derrida, my intention in this paper is to question the assumption that semiotics is straightforwardly legible, such that it can inspire, or be applied to, or provide the philosophical underpinnings for thinking what it is that living systems are and do. For in claiming that semiosis structures living systems, biosemiotics rather provocatively insinuates a kind of originary relationality or difference that we can juxtapose with Derrida's notion of différance. If we want to truly understand ontogenesis in all its complexity and unfolding, if we want to uncover the full implications of suggesting, as biosemiotics does, that everything is connected, then my argument here is that an appreciation of Derrida's work could be immensely productive for biosemiotics as a field.

Cells as semiotic systems
practical and quantitative implications

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The complexity of cellular communication processes needs an explanatory framework that goes beyond one-to-one relational interactions. Life acts according to distinct rules which determine arrangements of components in time and space. Those rules are qualitatively different from classical chemical or physical laws and reveal the very hierarchical nature of living entities. As shown by Marcello Barbieri, several cellular processes are indeed instantiations of rule-based, encoded interactions following sign-mediated (semiotic) organizational principles. Nevertheless the question remains, if this analogy is (if at all) only of epistemic value, or if there are even practical and quantitative implications. Here it will be outlined that regarding cells as semiotic systems makes sense only when quantitative aspects of cellular organization are taken into consideration. For this reason, *signs are* reconsidered as *quality-quantity trade off knots*. It is argued that "cellular needs" are best met by implementation of sign-mediated representations which further raises questions on the physical grounding or driving forces of semiosis. With "cellular needs" coordination of information transfer from changes of internal and external contexts is meant. Another point of view on cells as semiotic systems is that of genetic engineering compared to chemical engineering, as exemplified by contrasting "real" cells vs. chemical cells or protocells. This comparison obviates a qualitative difference in the underlying respective *logical* structure and the "creative potential" offered by each system. In the same line of argument, genetic manipulation of cells and organisms as practiced for decades has proven cells to be semiotic systems, albeit unconscious to the scientific community. To sum up, in this talk practical and quantitative support of a rather qualitative theory of sign-mediated cellular processes (i.e. "biosemiotics from bottom up") will be provided. Further consequences and questions that this perspective raises will be discussed, e.g. engineering perspectives ranging from synthetic cells to biorobots and ALife. The offered approach should help to better communicate biosemiotic topics to a broader audience in the life sciences.

Musical sense-making between nativism and empiricism: an evolutionary approach to musical semantics

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This paper is about musical semantics. It deals with mechanisms of sense-making which rely on evolutionary older levels of coping with the sounds as well as higher-level functions of the brain. Revolving around the nature/nurture dichotomy—what is innate (nature) and what is acquired (nurture)?—, it considers the role of the music listener and his/her dispositional machinery to respond to sounding music, stressing the conception of music-as-dealt-with rather than a static conception of music as structure or artefact. In an attempt to bring together contributions from neuromusicology, linguistics, evolutionary psychology and theoretical biology, it has its major focus on the musical experience which is shaped by ongoing epistemic interactions with the sounds. The latter are partly autonomous and partly constrained but all of them stress the realisation of systemic cognition in the context of a living system‘s interactions with the environment. Cognition, in this view, is not to be considered as a “recovery” or “projection” but as “enactment” on the world. As such, listeners can be conceived as adaptive devices who can build up new semiotic linkages with the sounding world. These linkages can be considered as by-products of both biological and cultural evolution and can be helpful in providing coordinative frameworks for achieving diversity of thought, cultural invention, social interaction and optimal coregulation of affect. Music, in particular, possesses common attributes across cultures which exploit the human capacity to entrain to external stimuli and which present a rich set of semantic fields. As such, it has inductive power for sense-making and for reactive behaviour. There is, however, a tension between reactions that are universal to a great extent and those that stress the differences between listeners. This holds true especially for the aesthetic enjoyment and emotional power of music. Much is to be expected here from the neurobiological approach which has stressed already that the evolutionary infrastructure of music may be subcortical to a great extent. Besides, however, there has been led emphasis also on the role of modular genetic evolution for the existence of sophisticated cognitive faculties which are located in the cortex of the human brain.

Becoming a semantic object
Bacterial colony as a bio-aesthetic model

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We discuss the role of aesthetics in our study of bacterial colonies. We already presented a long time cultivation of bacteria colonies as a process delivering colonies suitable for morphology and signaling research but these colonies were obtained when we looked for types with most loosed body plan. The desired colonies give out new types with random morphologies, demonstrate eccentricity in appearance and can not be found in nature. We cultivate the colonies to show the strongest flamboyance but never know what will be the result of next colony generation. The colonies are thus partly an artifact of our production but generally it is a pure haphazardness that creates knew type.

The colony becomes a type only when it grows to a certain visible form. This momentum changes a swarm of bacteria into a semantic object which we evaluate aesthetically. We study its color, shape and general complexity. These features seem surprisingly harmonized and our study suggests the use of bacterial colony as a model for exaptation in biological aesthetics.

Partitioned semiosphere: barriers of communication and relativistic epistemology

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Exchange of messages normally occurs within a set of agents with compatible interpretation systems, which I call “communication system”. The simplest communication system includes one organism involved in asynchronous self-communication known as memory (sending messages to the future state of the same organism). Genetic self-communication is similar to memory but extends beyond temporal boundaries of one organism. The genome carries functional information accumulated by millions of previous generations and can be viewed as a repository of nano-technologies developed by living cells to perform their functions and build a full organism in uncertain environments. Each biological species is a genetic communication system that carries unique functional information together with inference rules that determine evolutionary directions and constraints. But genetic information is generally not transferrable between species because of incompatibility of interpretation systems. The idea of relativistic epistemology is that communication system is the carrier of the meaning of signs circulating in that system. In particular, the relation between a sign and encoded function is established contingently by organisms for their own benefit. Although one organism can participate in multiple communication systems (e.g., molecular signaling, hormone control, memory, and social communication), the exchange of messages between different communication systems is limited and usually not productive. However in the case of symbiosis, a small portion of signs is shared between communication systems to coordinate the physiology of interaction. According to relativistic epistemology, functional information is not universal and require specific metainformation for its processing. Furthermore, there is no guarantee that there is a learning trajectory which eventually leads to the understanding of a given message. Thus, the semiosphere appeared partitioned into millions of poorly connected communication systems, each with its own history and accumulated experience.

Biosemiotic Neurobiology of Finger-Snapping as End-Effector Sonic Signaling Process

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The principal sonic signs produced by the ballistic movements of hand end-effectors of human organisms are slapping, finger tapping, and finger snapping. Slapping involves hitting another surface, either corporeal or material, with the fingers and palm of the anterior hand or in a back-handed slap with the fingers and metacarpal region of the posterior hand. Thus, the hand might slap a material surface such as a tabletop or a corporeal surface such as the emitter's chest or knee or a receiver's cheek, back, buttocks, or other body part. Clapping is a form of slapping, a sonic sign that is produced through the ballistic movement of the fingers and palms of the anterior hand end-effectors together or, as in the "high-five" gesture, through the ballistic movement of one person's with another person's fingers and palms of the anterior hand end-effector. Punching is a variation of slapping, a movement in which the fingers and thumb of the posterior end-effector are clenched and another material or corporeal surface is struck with the phalangeal region of the end-effector, as in striking a wall, some part of the body of another person, or the air, and sometimes with the lateral distal phalanx of the thumb and the three distal phalanges of the index finger of the clenched end-effector, as in striking one's own chest or forehead. Finger tapping involves hitting the palmar heads of each of the distal phalanges V through II in rapid succession against a material or corporeal surface. The purity of the sonic signs produced by slapping, clapping, punching, and tapping is such that the sounds are commonly described onomatopoetically as *slap*, *clap*, *punch*, and *tap*; that is, the signifier *slapping* produces its own modality, *slap*, and so on. These sonic signs are distinctive also in that they are produced when the hand end-effector comes into ballistic contact with a surface other than itself: a material surface, the epidermis (or clothing) of another human organism, or another part of its own body. In contrast, finger-snapping is the only sonic sign produced when a human organism's hand end-effector comes into ballistic contact with itself. Specifically, the skin of the posterior distal phalanx of finger III (or II), in its ballistic movement after it breaks free from its ballistic pinching of the thumb, strikes the groove between the thenar eminence and the nail and posterior distal phalanx of finger IV (or III). Like *slapping*, *clapping*, *punching*, and *tapping*, *snapping* is a pure signifier producing its own modality, *snap*. Snapping is a signification from an emitter to itself or between an emitter and a receiver. The sonic sign of finger-snapping may signify a ballistic duration as in the idiom "like that" or a protracted metronomic duration as in keeping time to music or producing a percussive sound in musical performance. Also, it may signify an interpellative sound, as in summoning a waiter or otherwise attracting a receiver's attention. This paper proposes a biosemiotic neurobiology of finger-snapping as an end-effector sonic signaling process.

The Invention of the Clever Hans Effect: Was Sebeok Right?

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A considerable part of Thomas Sebeok's writings deals with cases of human-animal interspecific communication, including highly controversial ones. The aim of this paper is to analyze his thought about one of the most popular cases of guessingly successful, human-communicative-channel-using interspecific communication during the 20th century - the case of "Clever Hans". From 1904, this stallion and his owner W. V. Osten astonished both the public as well as the scientific community. This affair was according to mainstream history of psychology and behavioral science solved and scientifically explained by the German psychologist Oskar Pfungst (1874-1932). His „behaviouristic" explanation, i.e. the discovery that the horse, instead of acting really intelligent, solely reacted to his trainers unwitting cues , became known as the „Clever Hans effect". Sebeok was among the first researchers (outside of the narrow field of history of psychology) who thoroughly documented the solution of this enigma by Pfungst. His authority and explanatory principles was exceedingly positively assessed by Sebeok and it can be shown that Pfungst's work was highly influential on his understanding of human-animal communication, above all in his extreme anti-anthropomorphism. For Sebeok, Pfungst, his method and his theory was a guide how to explain nearly *all* cases of anthropomorphic skills in animals. Sebeok used Pfungst in his writings about Clever Hans and the "Clever Horses of Elberfeld" as a figure of a "man of science" fighting against parapsychological obscurantism.

However, some recent findings show that such a high appreciation of this historically somewhat nebulous figure may be inadequate. First, the "Clever Hans effect" was discovered by several researchers *before* Pfungst. Second, it shows up that the actual author of the often cited book *Clever Hans: The Horse of Mr. Osten* (1965, orig. in German 1907) might not have been Pfungst himself (the major part was for unknown reasons probably written by his teacher and supervisor, Carl Stumpf). Finally, there were other scientists involved in the solving of the "Clever Hans" enigma, (and later the case of the "Clever horses of Elberfeld"), who came with different explanations that oppose the "behavioristic" one.

The aim of this paper is neither to deny the existence of the "Clever Hans effect" *per se*, nor to criticize Sebeok for his utilization of this matter. On the historical cases of Clever Hans and kindred animals, we want to demonstrate some theoretical, methodological as well as historical aspects that might be of some interest for biosemioticians. (Paper supported by the Grant Agency of the Charles University, GAUK 113607/2007)

The hourglass, the zootype and the phylotypic stage

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The idea of organic memory is often used in biology, but the definition of this notion remains unclear. The DNA is understood as storage of genetic information (genetic memory); on the epigenetic level, the marks on the histone aminoacids, mainly the methylation of lysines and arginines, represent the memory of the cell state, transferable through the cell generation or maintaining pluripotency versus directing differentiation of the cell (cell memory).

In animal development, the phylotypic stage represents the bodily boundary between the cellular and the supracellular memory (Barbieri 2003). In this stage, embryos of taxonomically different vertebrates are though to resemble one another morphologically. Until now much controversy remains about at what time point of animal development the phylotypic stage appears and whether it even exists. Although the hourglass model of the phylotypic stage is generally accepted in developmental biology, some biologists consider this concept unreal (Bininda-Emonds, Jeffery, Richardson 2003). On the contrary, the other scientific results are supporting the concept of the phylotypic stage (Irie, Sehara-Fujisawa 2007) and even further supporting the hierarchical aspect of embryogenesis proposed by von Baer.

Also the modularity of embryogenesis developing directly after the phylotypic period (Galis, Metz 2001) can clear up the reason why there has to be such evolutionary conserved stage of animal development and why exactly at this time point the *Hox* genes begin to be activated.

After we called the stage of *Phylotype* a Barbieri's platform (Markoš 2007) and we started to work with this concept (Markoš, Švorcová, should come out in spring 2009), the aim of my contribution is to review the plausibility of the phylotypic stage period in vertebrates evolution and try to validate the Barbieri's theory of supracellular memory of the body plan with the current knowledge of molecular biology and comparative morphology.

On contrapuntuality.
Semiotic niche vs. ontological niche: the case of the Scandinavian wolf population

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In this talk I will argue that the notions of ‘semiotic niche’ (Hoffmeyer) and ‘ontological niche’ (introduced by myself) are complementary concepts. While the semiotic niche concept is best fitted to describe optimal ecological situations, in which ecosystems are functional, the ontological niche concept is better fitted to describe situations of ecosystem malfunction. The reason is that a ‘semiotic niche’ is plainly an expression of optimal (or desirable) ecological conditions and relations, whereas the ontological niche depicts the set (or ‘gestalt’) of contrapuntal relations that a being takes part in at any given point of natural history.

In one sense, therefore, the semiotic niche is a general concept, whereas the ontological niche is a specific concept. In situations where the ‘normal’ ecosystem is not left intact, a concept of relational being, such as that of an ontological niche, can be applied to exhibit in what way changing ecological conditions and relations affect the viability of a population of animals, and literally change their place in the world. Some examples will be provided in order to demonstrate the importance of not confusing a manifest ontological niche with the partly indiscernible semiotic niche.

One such example is the behaviour of Scandinavian wolves. Here, the semiotic niche of these wolves would represent their behavioural repertoire. It would be wrong, however, to assume that their current behaviour – as shy animals with a taste for moose and an evident preference for forest-covered, uninhabited habitats – simply reflects their general semiotic competence. Rather, it reflects how they apply their semiotic competence *in a certain ecological and cultural context*. The fact of the matter is that the behaviour of Scandinavian wolves to a substantial degree reflects our approach to them. In the same way as the shyness of this population results from our century-long hounding of wolves, their avoidance of built-up areas reflects their (partly embodied) experience with encountering people. Wolf behaviour in modern times, to cut a long history short, is just as much an indicator of human behaviour as it is an expression of what it is like to be a wolf.

Reconstruction of a Russian-language site in biosemiotics

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1. Biosemiotics and its dataware. The importance of the Internet in the development of biosemiotics study. Development prospects of biosemiotics in the Internet. Internet as an important means of biosemiotics development.

2. Description of an old site in biosemiotics (http://biospace.nw.ru/biosemiotika/index.htm): structure, design, the problem of update. The disadvantages of an old site. The necessity of a new site creation.

3. Projecting of a new site: used instruments, components, the rights of users, the structure of a menu, distribution. The system of site management. The information parts of the site. The selection of optimal means for a new site development. The selection of Content Management System(CMS), its characteristics, main opportunities.

4. Criteria for choosing the methods of promotion: lack of pecuniary costs, orientation for the audience, large quantity of users. Effective methods of a new site promotion: free registration in search systems, free registration in catalogues, placement of notices on forums close to research area, mailing to the specialists in the sphere of biosemiotics and so on.

5. The development and description of a new site. The description of different sections of the site. Possibilities of a new site administration. Site optimization. Site design in accordance with research area and purpose.

6. Comparative analysis of an old site and a new one. The advantages of a new site. Comparative analysis of technical characteristics of a new site and the other foreign sites in biosemiotics.

Linguistic metaphor of life – potential and limites of its application in analysis of different texts

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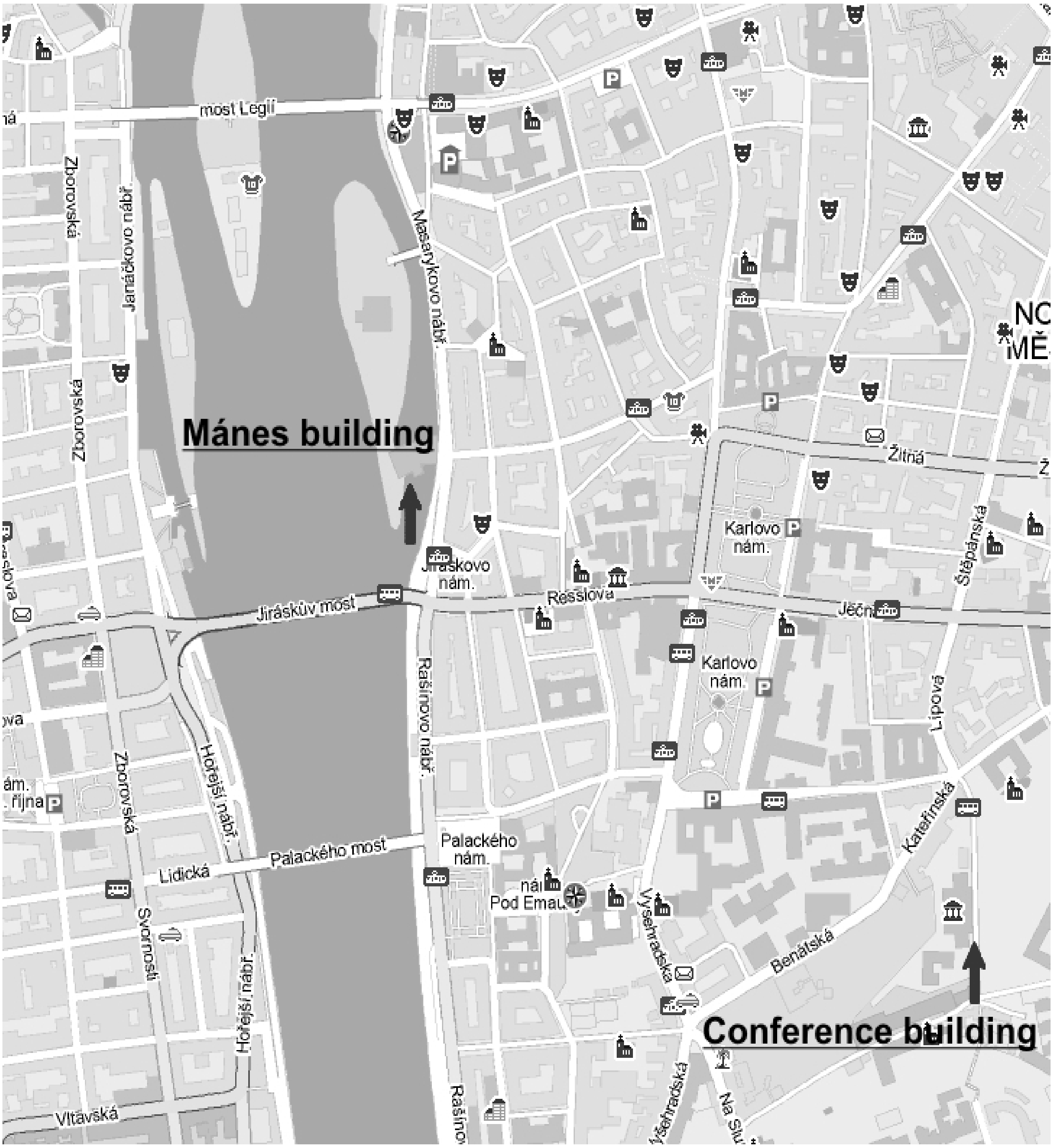
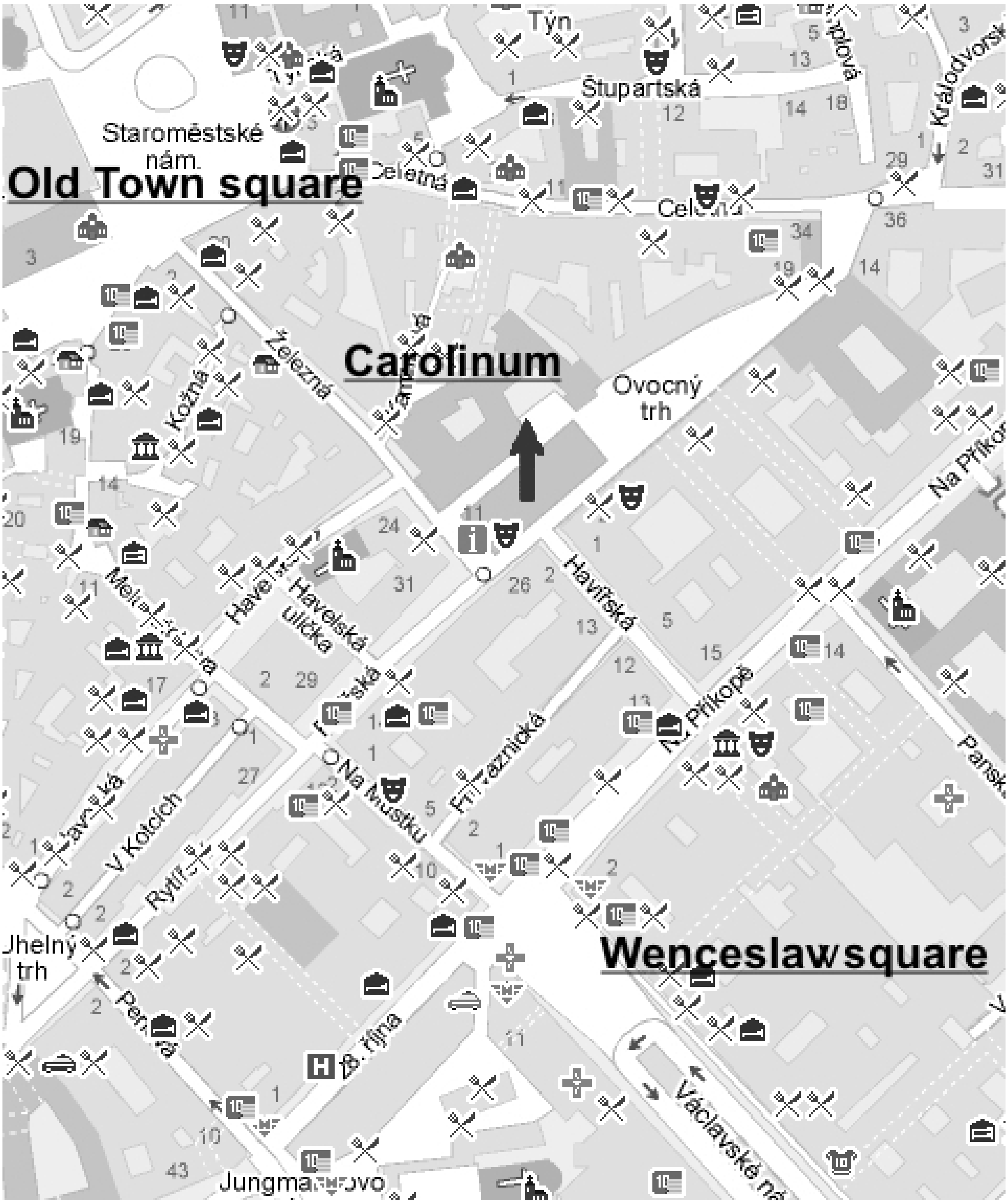
We can perceive genetic texts as a simple sequence of characters which has a specific alphabet size (4-characters in nucleotides sequences or 20 characters in protein sequences of amino acids), a certain length of sequence and other parameters. In the same way, it is possible to analyze each such a sequence of characters, no matter whether it is human, genetic or another text. For analysis of richness of "vocabulary" used in human and genetic texts, the method of linguistic complexity suggested by E.N. Trifonov in 1995 was used. Not only complexities of different human texts but also complexities of genetic and human texts, nucleotide sequences and their translated product – proteins and other examples, can be compared to each other. The method of complexity can be useful for searching for repetitive sequences in low-complexity regions in genetic texts or it can be used similarly as multiple- alignment in the field of genomics.

According to our results, the complexity of human texts is lower by several orders of magnitude in comparison with genetic texts. This reflects fundamentally different nature of genetic and human texts on the level of the code.

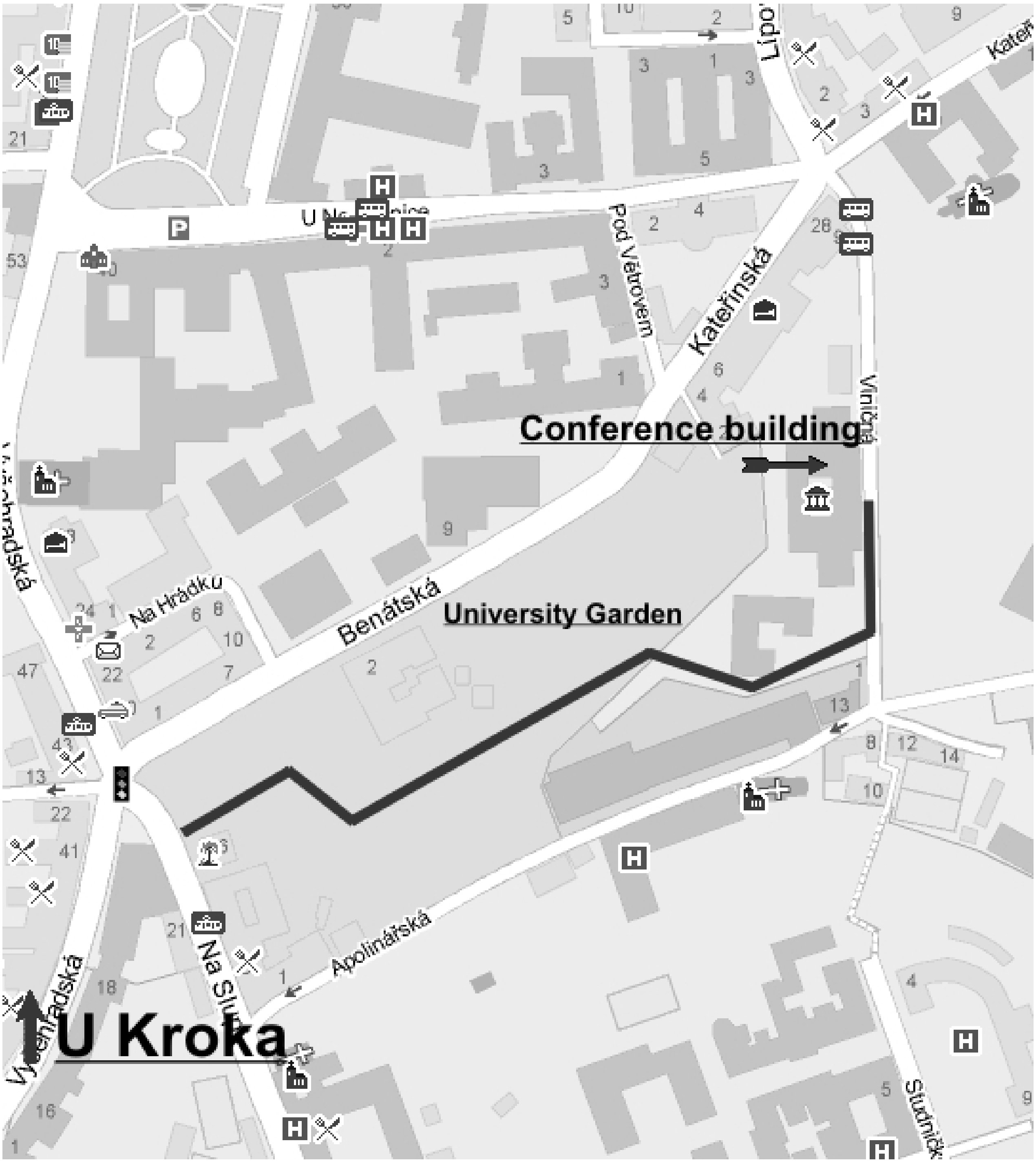
MAPS



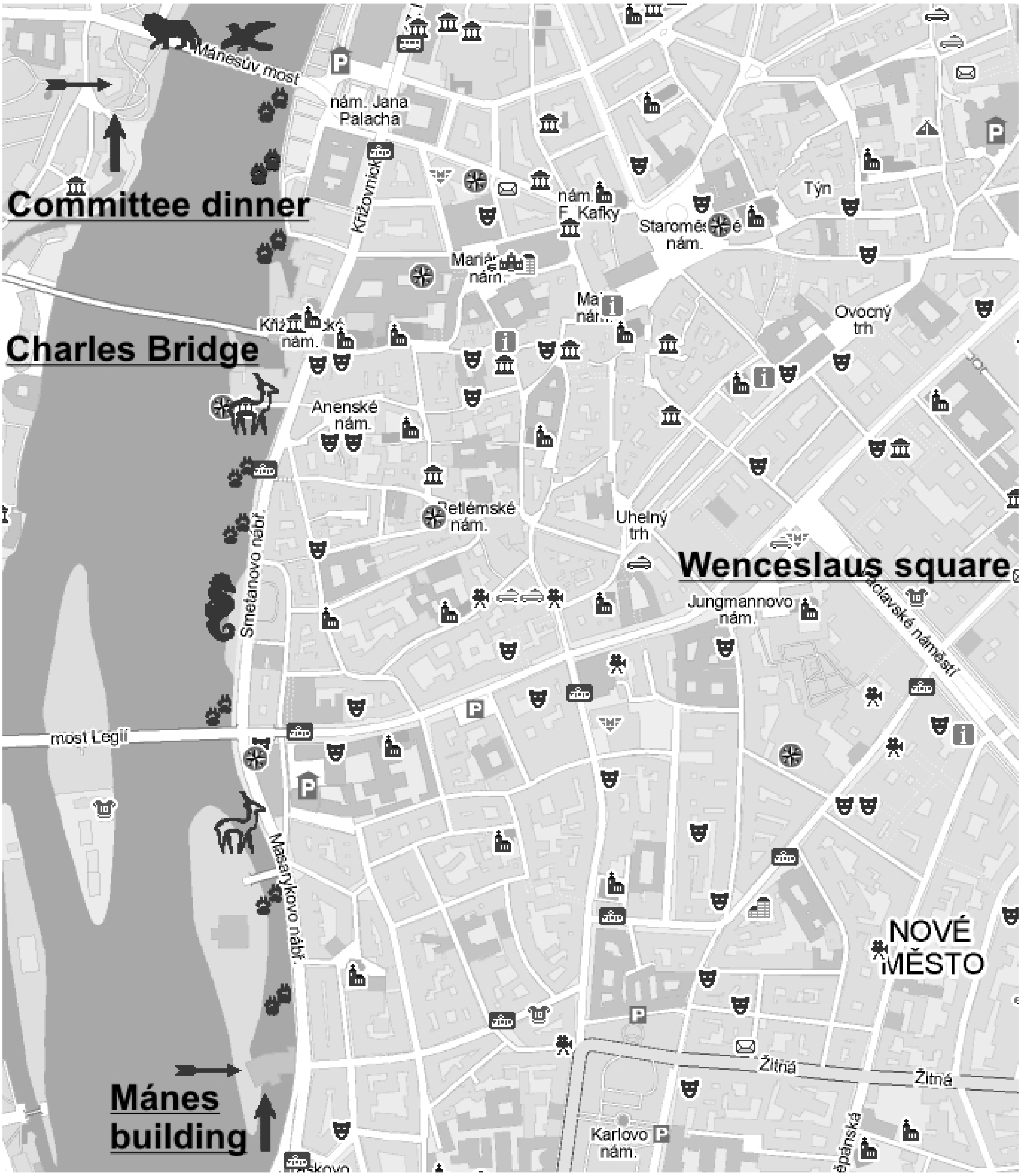
The location of the Mánes restaurant (the Friday dinner party place)



The location of the Carolinum building in the town centre



The way from the restaurant "U Kroka" where the Uexküll workshop takes place to the conference building in Viničná 7 through the botany garden. (Thursday noon)



Way to the committee dinner place – Kolkovna Fish restaurant (Thursday 20:00)