Gatherings in Biosemiotics 2017

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WHAT IS BIOSEMIOTICS?

Perhaps one of the most succinct definitions of biosemiotics appears in the text appearing on the website of the International Society for Biosemiotic Studies, where biosemiotics is defined as:

> "the study of the myriad forms of communication and signification observable both within and between living systems, Biosemiotics is thus the study of *representation*, *meaning*, *sense*, and the biological significance of all kinds of sign processes in nature from intercellular signaling processes to animal display behavior to the human-language-based communication of abstract symbolic thought. As such, the interdisciplinary research project of biosemiotics is attempting to re-open the dialogue across the life sciences – as well as between the life sciences and the humanities – regarding what, precisely, such ineliminable terms as *sign* and *meaning* ultimately refer to in the context of living, interactive, complex-adaptive systems".[3]

Biosemiotics is thus the study of meaning-making and its consequences in living systems, and much of its focus is on investigating and understanding pre-linguistic sign processes in both humans and other organisms.

Such a semiotic approach includes the refinement of both epistemological and ontological assumptions regarding the role of sign relations in organizing living systems and their communities. But it also includes empirical studies and experimental undertakings in order to discover the role of meaning-making in developmental processes, and to provide the analytical and conceptual tools for distinguishing between the different types and levels of semiosis.

BIOSEMIOTIC QUESTIONS

What are the some of the questions to which biosemiotics may provide a useful understanding? Here are just a few.

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[1] The editors decided to give (relatively) free hand to the authors of this volume as to spelling the words and terms with non-established orthography (e.g. Umwelt or umwelt? etc.), as well as to choosing either British or American spelling for their contribution. – *Editors' note.*

[2] The authors are currently the President and the Vice-President of the International Society for Biosemiotic Studies.

[3] A version from www.biosemiotics.org

(a) Investigating the ontogeny and phylogeny of *semiosis* (meaning-making in the natural world).
(b) Deriving the mechanism of primary semiosis that originates with living systems, as opposed to the mere origin of self-reproduction or membrane closure.
(c) Investigating the relationships between the structure and dynamics of niche construction and the types of semiosis accessible for an organism in the construction of its umwelt (world of meaningful relations).
(d) Analysis of the temporal structure of semiosis – the simultaneity of meaning making and the formation of a subjective present within an umwelt.
(e) Establishing the typology of umwelten, and specifying the methods for studying the different umwelten specific to different groups of living beings.
(f) Explicating the types of pre-linguistic interpretation in terms of their primary logic, and discovering the mechanisms upon which such logic is realized in action.
(g) Discovering the types and mechanisms of semiotic categorization both at the individual and the social level.
(h) Describing the major mechanisms of learning – e.g., imprinting, conditioning, imitation, linguistic convention, etc. – as these relate to the major types of semiosis and signs.

On the History of Biosemiotics

The contemporary project of biosemiotics took its shape in the early 1990s, particularly due to the mutually supporting work of the linguist and polymath Thomas A. Sebeok (1920-2001)[4] and the microbiologist and philosopher Jesper Hoffmeyer (b. 1942).[5]

However, the history of biosemiotics – which is to say, the history of studying the sign processes that are involved in life processes – can be traced to antiquity, and has manifested in various fields of human inquiry (such as diagnostic medicine and animal husbandry) throughout all of human history. Investigation into the natural phenomenon of *signification per se*, however, is a more modern development, and within biosemiotics, one must count such important precursors as Jakob von Uexküll (1864-1944), Charles Morris (1903-1979), Gregory Bateson (1904-1980) and many others.[6]

The works of Ferdinand de Saussure (1857-1913) guided and inspired some of the earliest attempts at developing a discipline of biosemiotics, while the triadic sign-logic of Charles Sanders Peirce (1839-1914) has come to be adopted by the majority of modern biosemioticians.[7]

The story of Sebeok's four decades long project of bringing life scientists, social scientists and those who might be called "sign scientists" (e.g., linguists, literary analysts, philosophers and humanities scholars more generally) into dialogue with one another so as to result in modern-day interdiscipline of biosemiotics has been told extensively elsewhere.[8] And since his passing in 2001, the field has continued to diversify, flourish, and grow, as the first decade of the 21st century alone saw the founding of the International Society for Biosemiotic Studies in 2005,[9] the *Journal of Biosemiotics* (Nova Science, 2005) and

[4] The book edited by Sebeok and Umiker-Sebeok (1992) was the very first one using the term *biosemiotics* in its title.
[5] Hoffmeyer 1996; 2008.
[6] Cf. Favareau 2007; 2010 for a fuller account of the history of biosemiotics and its precursors.
[7] Cf. Hoffmeyer 1996; 2008; Stjernfelt 2007; 2014; Deacon 1997; 2011.
[8] Cf. particularly Barbieri 2002; Brier 2003; Cobley *et al*. 2011; Cobley 2016; Deely 2015; Favareau 2007; 2010; Kull *et al.* 2009; Kull 2015; Sebeok 2001a.
[9] Cf. Favareau 2005, as well as www.biosemiotics.org

Biosemiotics (Springer Publishers, since 2008), as well as a book series on biosemiotics (also by Springer, since 2007)[10] – all of which have become extremely popular and valuable resources for biosemiotic study by scholars around the world.

ON THE GATHERINGS IN BIOSEMIOTICS

Since 2001, the International Gatherings in Biosemiotics meeting have been held annually.[11] Researchers from 18 different countries were present at that initial Gatherings, with backgrounds ranging from physics and molecular biology to animal ethology, robotics, linguistics, evolutionary psychology and philosophy of semiotics and of mind. These meetings are called "gatherings" by the proposal of Jesper Hoffmeyer, in order to mark that our aim is not to follow the strict format of traditional academic conferences but instead to create a free atmosphere of creative discussion among scholars and students from various disciplines, but who are yet united by the questions raised by the meaning-making abilities of living systems.

Thus far, the Gatherings in Biosemiotics have been held in the following places:

1. Copenhagen, Denmark
2. Tartu, Estonia
3. Copenhagen, Denmark
4. Prague, Czech Republic
5. Urbino, Italy
6. Salzburg, Austria
7. Groningen, Netherlands
8. Syros, Greece
9. Prague, Czech Republic
10. Braga, Portugal
11. New York, USA
12. Tartu, Estonia
13. Castiglioncello, Italy
14. London, UK
15. Copenhagen, Denmark
16. Prague, Czech Republic
17. Lausanne, Switzerland

And we certainly expect this series to continue long into the future.

BIOSEMIOTICS AND ITS ROOTS IN SWITZERLAND

The 17th Gatherings in Biosemiotics meeting takes place at the University of Lausanne in Switzerland.

A glimpse into the intellectual history of this country reveals an extraordinary rich legacy for intertwining the study of living systems, biology, and the study of meaning making structures and processes, i.e., semiotics (even if the latter name has not been much used explicitly there). It would be fascinating to delve into the history of ideas in Switzerland in and around of biosemiotic understanding and inquiry – something that can obviously best be

[10] Additional notable sources for biosemiotics include Barbieri 2007; Emmeche, Kull 2011; Maran *et al.* 2011; Markoš *et al.* 2009, and many others.

[11] Cf. an account of the meetings' origin and an overview of the first twelve Gatherings in Rattasepp, Bennett 2012.

done by local scholars. Let us just note as part of our brief comments here a couple of interesting points as related to some very influential thinkers.

A solid basis for the rich and elaborated thinking on living systems was laid down by the Swiss naturalists of the 18th century – the "father of biology" Abraham Trembley (1710-1784), Charles Bonnet (1720-1793) and his theories regarding the self-development and *palingénésie* of the whole ladder of organic beings, and Albrecht von Haller (1708-1777), physiologist and physician, the "father of modern physiology".

Following in this grand tradition, the 19th century distinguishes itself with the dynasties of taxonomists de Candolle and de Saussure,[12] including several generations of scholars examining organic diversity on the basis of structural methods.

Switzerland has also gifted the world with remarkable figures in developmental biology and histology, such as Albert von Kölliker (1817-1905), René-Édouard Claparède (1832-1871), or Wilhelm His (1831-1904), and the proponent of orthogenesis, Carl Wilhelm von Nägeli (1817-1891).

Equally remarkable is how many of world leaders of plant taxonomy, such Gustav Hegi (1876-1932), and plant communities, such Josias Braun-Blanquet (1884-1980) come from one and the same country – in addition, one of leaders of idealistic morphology, Adolf Naef (1883-1949).

It is highly unlikely that this rich intellectual foundation in the processes of life had no role in the formation of Switzerland's most influential semiotician, Ferdinand de Saussure (1857-1913).

In the 20th century, we find in Switzerland a number of scholars whom we already identify as biosemioticians, such as the zoologist Adolf Portmann (1897-1982), and most certainly, Heini Hediger (1908-1992), the director of Tierpark Dählhölzli (1938-1943), Zoo Basel (1944-1953) and Zürich Zoo (1954-1973).[13] Let us also recall the work in ecosemiotics by Alfred Lang (1935-2008), a psychologist from the University of Bern,[14] as well as Ernest W. B. Hess-Lüttich (b. 1949) from the same university.

Most recently, the group of scholars studying history of structuralism and linguistic thought, established by Patrick Sériot at the University of Lausanne, and now led by Ekaterina Velmezova, has made important impacts on our further understanding of both the international and local roots of biosemiotics.[15]

CODA

Biology is changing. In a Royal Society meeting on evolutionary biology in November 2016,[16] it was felt that the move towards the views and approaches such as those developed in biosemiotics are increasing in acceptance as well as in sophistication and complexity.

In the words of the President of the International Society for Biosemiotic Studies, "the time will come when every self-esteemed scholar of life proudly identifies their work as biosemiotics".

Our enthusiasm for biosemiotics, we feel, is thus well founded. And we want to share this with our new and old colleagues in Switzerland.

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[12] Entomologist Henri Louis Frédéric de Saussure (1829-1905) was father of the linguist Ferdinand de Saussure.
[13] Cf. Sebeok 2001b; Turovski 2000.
[14] Cf., e.g., Lang 1998.
[15] Cf. Sériot 2014; Velmezova *et al*. 2015.
[16] Cf. a review about this event in Kull 2016.

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Biosemiotica Lausannensia: Interdisciplinary Research in the Perspective of Studying the History of Language Sciences

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A TRIBUTE TO THE *GENIUS LOCI*

One of the best known symbols of linguistics in Switzerland – and, what is more, a symbol associated with the Francophone part of Switzerland (let us pay tribute to the *Genius Loci* of the 17th Gatherings in Biosemiotics) – is certainly Ferdinand de Saussure (1857-1913), to whom many researchers refer as the founder of at least one of the modern semiotics' trends.[1] Biosemiotics is integrated in another trend – going back to Charles Sanders Pierce (1839-1914) – and is not only associated with human (and mostly verbal) signs and their systems. However, the mention of Saussure in the context of the organization of the first important international conference on biosemiotics in Switzerland – at the Faculty of Arts of the University of Lausanne, and primarily coordinated by linguists and historians of language sciences – also seems important in the light of the connection between the humanities and the natural sciences. Referencing Saussure here is entirely relevant again. Natural-scientific specialization is known to have prevailed in the "scientific tradition" of the de Saussure family before the birth of Ferdinand. In particular, among his famous ancestors were entomologist, geographer and explorer of nature Henri de Saussure (1829-1905) (Ferdinand's father), but also geologist, botanist and climber Horace-Bénédicte de Saussure (1740-1799) (his great-grandfather), who passed on his interest in the study of plants to his son Nicolas-Théodore de Saussure (1767-1845)… Published under the name of Ferdinand de Saussure in 1916, *The Course of General Linguistics* – the best known book written under his name and one of today's most famous linguistic books – contains numerous comparisons and metaphors (both Saussure's students' records and his own notes contain them too),[2] including some biological ones.[3]

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[1] Speaking about the "Saussure-'semiotician'", let us quote the corresponding fragment from the *Course in General Linguistics*, which has already been so much commented: "*A science that studies the life of signs within society* is conceivable; it would be a part of social psychology and consequently of general psychology; I shall call it *semiology* […] (from Greek *sēmeîon* 'sign'). Semiology would show what constitutes signs, what laws govern them. Since the science does not yet exist, no one can say what it would be; but it has a right to existence, a place staked out in advance. Linguistics is only a part of the general science of semiology; the laws discovered by semiology will be applicable to linguistics, and the latter will circumscribe a well-defined area within the mass of anthropological facts" (Saussure 1916 [1959, p. 16]).

[2] Cf., for example, Normand 1995.

[3] For instance: "the life of languages" (Saussure 1916 [1959, p. 4]); "[language] organism" ("My definition of language presupposes the exclusion of everything that is outside its organism or system" [*ibid*., p. 20]); "distinct branch [of dialects], detached from the trunk" (*ibid*., p. 211); "[a] man proposing a fixed language that posterity would have to accept for what it is would be like a hen hatching a duck's egg: the language created by him would be borne along, willy-nilly, by the current that engulfs all languages" (*ibid*., p. 76); transversal versus longitudinal cuts of plants as illustrations of the opposition of synchrony and diachrony (*ibid*., p. 87)… – all this despite Saussurean conviction that metaphors of this kind are not very useful for language sciences: according to Saussure, several

Saussure and his works have already been written about in the light of biosemiotics as such,[4] in particular, not so long ago, in a volume prepared by both linguists and biosemioticians.

LINGUISTICS AND BIOSEMIOTICS

The title of this book, the work on which had been, to a large extent, conducted at the Department of Slavic and South Asian Studies (SLAS) and at the Centre of Linguistics and Language Sciences (CLSL) of the University of Lausanne (UNIL) – *Biosemiotic Perspectives on Language and Linguistics* – indicates the connection between biosemiotics and linguistics, the interdisciplinary nature of this volume, in which specialists in the humanities and in the natural sciences from several countries have participated. As it is noted in the foreword to the book, the very idea of this volume had originated during one of the Gatherings in Biosemiotics:

> "The idea of the book arose during the 12th Gatherings in Biosemiotics (Tartu, July 2012), which included a special session entitled 'Language and Life: The double interface'.[5] At that time, reading Donald Favareau's review 'Twelve years with the Gatherings in Biosemiotics' published in a book describing this series of annual meetings,[6] we paid attention to the fact that he mentioned very few linguists who had given talks in the Gatherings between 2001 and 2011. […] Even if the choice of designations (are they 'linguists'? or 'philologists'? or maybe 'philosophers [of language]'?) can sometimes alter the interpretation of facts (*nomina sunt odiosa*), this rather insignificant rate of *linguists* interested in biosemiotics provoked not only the question about the possible reasons for this state of affairs, but also a wish to contribute to the improvement of this situation".[7]

It was not accidental, of course, if linguists hadn't cooperated very actively with biosemioticians:

> "[…] *prima facie*, already a difference in the objects of study in the case of linguistics and biosemiotics seems significant. According to Ferdinand de Saussure's classical work, linguistics (even in his seemingly narrow definition) is a part of semiotics ('semiology'). Charles S. Peirce would not disagree. And if biosemiotics studies signs and sign systems in regard to all living organisms

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metaphors are just difficult to avoid in any case. He says, in particular, the following: "We now realize that Schleicher was wrong in looking upon language as an organic thing with its own law of evolution […]" (*ibid*., p. 87); "[t]he new school, using a more realistic approach than had its predecessor, fought the terminology of the comparative school, and especially the illogical metaphors that it used. One no longer dared to say: 'Languages does this or that,' or 'life of language,' etc. since language is not an entity and it exists only within speakers. One must not go too far, however, and a compromise is in order. Certain metaphors are indispensable. To require that only words that correspond to the facts of speech be used is to pretend that these facts no longer perplex us. This is by no means true, and in some instances I shall not hesitate to use one of the expressions condemned at that time" (*ibid*., p. 5).

[4] Among the articles published during the last several years, let us mention, for example, the work Chien 2015.

[5] Cf. Cowley 2012.

[6] Favareau 2012.

[7] Kull, Velmezova 2015, pp. 1-2.

> (including human pre-linguistic semiosis), it may come very close to providing a general theory of semiotics.[8] In this case, the very objects of biosemiotics and linguistics, in all their diversity, would correlate as general and specific. It explains that linguists can feel more easy staying in the 'comfort zone' of their own object of study,[9] but hardly justifies the rather limited interest of biosemioticians in linguistics. Though, of course, the proper focus of biosemiotics lays at non-linguistic semiosis, so they therefore have an excuse. After all, biosemioticians can even be defined as pre-linguistic or non-linguistic semiotics".[10]

However, in spite of these theoretical problems, the volume *Biosemiotic Perspectives on Language and Linguistics* has been published, with the participation of specialists in various fields of academic knowledge.

In a sense, the Gatherings in Biosemiotics organized in Lausanne in 2017 continue this project of cooperation between linguists and biosemioticians: that is why, the Scientific Advisory Committee of the 17th Gatherings – Prisca Augustyn (Florida Atlantic University, USA), Luis Bruni (Aalborg University, Denmark), Paul Cobley (Middlesex University, UK), Yagmur Denizhan (Bogazici University, Turkey), Filip Jaroš (University of Hradec Králové, Czech Republic), Timo Maran (University of Tartu, Estonia) and Ekaterina Velmezova (local organizer) – inviting scholars to submit abstracts of presentations centering on the sign-processes in living systems, in synchrony and diachrony, particularly welcomed research in the field of the areas of "Biosemiotics and linguistics" and "The implications and relations of biosemiotics to philosophy and humanities".

From Interdisciplinary Research to History of Ideas

The interdisciplinary nature of research in general also distinguishes several areas of academic work which are conducted at the University of Lausanne, in particular at the linguistic Chair of the "Slavic" part of the SLAS Department. The main focus by linguists from this part of the Department is on history and epistemology of language sciences. It is reflected both in their pedagogical work (organization of courses on the history of linguistic ideas for students of different levels, supervision of graduate and doctoral works, organisation of doctoral schools, etc.) and in their academic activities (organization of conferences and congresses, publication of monographs and collections of articles, etc.).[11]

Work on the study of history and epistemology of ideas is often successfully combined with studies of an interdisciplinary character. For example, in the above-mentioned collection of articles *Biosemiotic Perspectives on Language and Linguistics*, a significant part is concerned with studying linguistics in connection with biosemiotics in the light of the history of ideas: the topic has been evidently receiving an ever increasing attention from linguists, biologists, semioticians, historians of ideas, as well as philosophers. Several contributions on the history of biosemiotic and linguistic ideas in their interrelation have been gathered in a particular segment of the book (Part IV: History of ideas).[12] As it has been emphasized in the

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[8] Cf. also Kull *et al.* 2009, p. 171 about biosemiotics aiming at general semiosis.

[9] Cf. the following observation by one of the participants in our project: "Linguists attending the biosemiotic *Gatherings* conferences always run the risk of being perceived as naïve or uniformed about the many layers of language and communication that the inadequate abstractions in the field of linguistics cannot address" (Augustyn 2012, p. 185).

[10] Kull, Velmezova 2015, pp. 2-3.

[11] Cf. http://www.unil.ch/slas/home/menuinst/langues-slaves.html

[12] Cannizzaro, Cobley 2015; Chien 2015; Neubauer 2015; Robert 2015; Velmezova 2015.

introduction of the book, "[b]eing last, this part is far from being least not only as to the number of contributions it contains, but also because of the fact that historical questions are discussed, in one way or another, in the majority of texts presented in this book. It appears therefore that history and historiography of sciences provoke today much more enthusiasm from those interested in linguistics and biosemiotics than, for instance, any empirical research".[13]

GOING BACK TO THE *GENIUS LOCI*

The combination of interest in interdisciplinary research and in the history of ideas is also reflected in the pre-conference day, organized within the framework of the Gatherings in Biosemiotics in 2017. Most of its participants are collaborators of the SLAS Department and even several UNIL students: in the spring semester of 2017, one of the Master's courses, entitled "Linguistics and Biology in the History of Ideas: At the Intersection of Theoretical Influences and Models", was organized precisely taking into consideration the upcoming Gatherings in Biosemiotics.

Some of works that will be presented at the Gatherings and which were conducted by students who participated in this course, are devoted to the investigations of researchers who reflected upon linguistics in connection with biology and who were, in one way or another, connected with the so-called "Russian scientific tradition", studied at the SLAS Department. Among the scholars to be discussed by the UNIL students will be: Roman Jakobson (1896-1982) (one of his numerous academic interests was the study of aphasia); neuropsychologist Alexander Luria (1902-1977), who is also very well known for his work on neurolinguistic studies (the paper is by Émilie Wyss); contemporary Georgian linguist and member of the Russian (former Soviet) Academy of Sciences Tamaz Gamkrelidze (b. 1929), dwelling on the analogy between linguistic and genetic codes and discussing in this regard the famous linguistic theories of Nicholas Marr (1864-1934), who strongly influenced the development of humanities in the Soviet Union in the past century (Mallory Favre's contribution); born in Poland (in 1938) and currently working in Australia linguist Anna Wierzbicka, whose research on semantics has been very positively received in Russia. Several papers from this pre-conference day, prepared by PhD students and by collaborators of the SLAS Department, are also related to the history of Russian linguistics: analyzing the intellectual heritage of Andrey Fedorov (1906-1997) (often considered as one of the founders of the Soviet linguistic translation theory), Anna Isanina will speak about the possibility to use biological terms in the discussion of "real cognitive processes behind translation procedure". Former holder of a fellowship at the Department Pavel Arsenev (currently representing the University of Geneva) in his paper on the "biological bias in literary criticism" from formalism to Franco Moretti (b. 1950) is going to refer to the names of famous Russian formalists Viktor Shklovsky (1893-1984) and Yury Tynyanov (1894-1943). Other papers of the pre-conference day concern the historical nature of the relationships between biosemiotics and the humanities going beyond the "Slavic world": they will be presented by Lausanne researchers Malika Jara-Bouimarine (studying "[t]he Metaphor of Life in Charles Bally's Work through the Prism of

[13] Kull, Velmezova 2015, p. 8. This interest in the historical aspect of relations between linguistics and biosemiotics allowed to launch a new stage of the editorial project, supposing collaboration of representatives from several academic fields: preparation of a special issue of the journal *Sign Systems Studies* on the topic of "Biosemiotics and Linguistics in Historical and Epistemological Perspectives". In the issue, to be edited by K. Kull and E. Velmezova and to be published in 2017, is expected to be collected a series of articles on historical and epistemological contexts and premises of theories, models and approaches combining or interrelating linguistics and biosemiotics. (The contributions are supposed to concern, for instance, topics like the role of biosemiotics for language theories, as well as the methods that biosemiotics and linguistics may share – in the light of the history of ideas.)

[Bio]Semiotics"), Sébastien Moret ("Linguistic Teratology") and Ekaterina Velmezova (discussing the limits of biosemiotics through the prism of a "biolinguistic" novel *The Embedding* by Ian Watson). Of course, without references to history, it is impossible to imagine the paper "Animal Studies in Linguistics" by Prisca Augustyn (Florida Atlantic University), also included in the programme of the pre-conference day and reminding that "[i]t was the work of Jakob von Uexküll, Konrad Lorenz, and Nicolas Tinbergen that influenced the development of Chomsky's biolinguistics and Sebeok's agenda from linguistics to zoosemiotics and eventually (bio)semiotics". In the context of interest in the intellectual history, let us also mention a special session which will be organized during the Gatherings by Donald Favareau and which will be devoted to the recently deceased John Deely (1942-2017) and to the examination of his major works.

However, one can suppose – and hope – that in many other conference papers history and epistemology of ideas will also be touched upon (although, of course, not necessarily in connection with language sciences): an appeal to history often seems necessary in order to better understand the current state of affairs of any discipline.

Gatherings in Biosemiotics have been organized since 2001. Each of the sixteen already organized Gatherings has had its own specificity,[14] which could be reflected both in the pre-conference days (if they were organized) and in the papers from the main conference programmes, in the intersection and in the correlation of topics and research problems presented at the conferences. This specificity often corresponded to the particular character of studies and academic programmes conducted by the host universities or / and research centres. We hope that one of the main academic trends of the host institution of the 17th Gatherings, the SLAS Department of the University of Lausanne, reflecting the interest in interdisciplinary research and in the connection of biosemiotics with the humanities in the general context of history and epistemology of ideas, will become the common thread of the Gatherings in Biosemiotics 2017, the symbol of which is a plant which could bear the name of *Biosemiotica Lausannensia*.[15]

Biosemiotica Lausannensia

[14] In a part of the book of abstracts edited for the Gatherings in Biosemiotics in 2012 (Rattasepp, Bennett 2012) one can find the programmes of all Gatherings, accompanied by the brief descriptions provided by their main organisers – Claus Emmeche (Gatherings organized in Copenhagen in 2001 and in 2003), Kalevi Kull (Tartu, 2002 and [in collaboration with Timo Maran and Silver Rattasepp] 2012), Anton Markoš (Prague, 2004 and 2009), Almo Farina (Urbino, 2005), Günther Witzany (Salzburg, 2006), Barend von Heusden (Groningen, 2007), Argyris Arnellos (Syros, 2008), Braga (João Carlos Major, 2010), New York (Victoria N. Alexander, 2011) (pp. 74-125), together with other review articles about the Gatherings held during the period of 2001-2012 (Hoffmeyer 2012; Sebeok 2012; Favareau 2012).

[15] E. Velmezova's drawing.

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CONFERENCE PROGRAMME

(UNIL, INTERNEF BUILDING, 275)

June 6

10:00-10:50 ***Welcome Reception and Registration***

10:50 Ekaterina Velmezova – *Introduction*

Pre-conference Day: Biosemiotics, Biology and Linguistics in their History

Session 1: General Problems through Particular Cases
Chairman: Myrdene Anderson

11:00 Prisca Augustyn – *Animal Studies in Linguistics*

11:30 Mallory Favre – *Tamaz V. Gamkrelidze's Vision on the Structural Isomorphism of the Linguistic and Genetic Codes*

12:00 Ekaterina Velmezova – *A "Biolinguistic" Novel through the Prism of Reflections on the Limits of Biosemiotics: Analyzing* The Embedding *by Ian Watson*

12:30 ***Lunch Break***

Session 2: Linguistics, Semiotics and Brain
Chairman: Prisca Augustyn

14:00 Anna Isanina – *Translation Theory's Conceptual Apparatus: Do Biological Terms Represent Real Cognitive Processes behind Translation Procedure? (A Look at Examples in Andrey Fedorov's Works)*

14:30 Margarita Makarova – *Do the Names of Colours Depend on our Visual Perception Skills? A Historical Review of the Problem*

15:00 Émilie Wyss – *Aphasia as a Semiotic Problem: Roman Jakobson's Point of View*

15:30 ***Coffee Break***

Session 3: Metaphors and Comparisons
Chairman: Filip Jaroš

16:00 Sébastien Moret – *Linguistic Teratology*

16:30 Malika Jara-Bouimarine – *The Metaphor of Life in Charles Bally's Work through the Prism of (Bio)Semiotics*

17:00 Pavel Arsenev (Rusakevich) – *To See the Forest behind the Trees: "Biological Bias in Literary Criticism" from Formalism to Moretti*

17:30-19:30 ***Welcoming Buffet***

June 7

Main Conference Programme

08:55 Organizing Committee – *Introduction*

Session 1: Theoretical Problems
Chairman: Alexei Sharov

09:00 Kalevi Kull – *On the Structure of Biosemiotic Theory: Are there any Rules in Organic Meaning-Making?*

09:30 Paul Cobley – *Is Observership the Same for Nature as It Is for Culture?*

10:00 Myrdene Anderson – *A Serious Case of Approach-Avoidance: Biosemiotics Meets Anthropocene*

10:30 ***Coffee Break***

Session 2: Philosophy and Epistemology
Chairman: Paul Cobley

11:00 Elena Pagni – *The Implications and Relations of Biosemiotics to Phenomenology and Humanities*

11:30 Jaroslav Krbec, Lukáš Zámečník – *Physical World and Semiosphere: Rethinking the Epistemic Cut*

12:00 Karel Kleisner – *Blinded by Blending: Natural and Artificial Signs of Social Impressions*

12:30 Riin Magnus, Tiit Remm – *The Self and the Other of Introduced Trees in Urban Environment: A Synthesis of Organismic and Sociocultural Perspectives*

13:00 ***Lunch Break***

Session 3: Perception and Intelligence
Chairman: Timo Maran

14:30 Franco Giorgi, Annibale Fanali, Francesco Tramonti – *Perception of Chaos: Challenge or Opportunity*

15:00 Jonathan Beever – *Biosemiotics of Sound and Silence: Interdependence and Value in a Noisy World*

15:30 Victoria N. Alexander – *Siri Fails the Turing Test: Computation, Biosemiotics and Artificial Life*

16:00 ***Coffee Break***

Session 4: Space(s) and Ecology
Chairman: Anna Isanina

16:30 Timo Maran – *Addressing Material Processes in the Framework of Biosemiotic Ontology*

17:00 Timothy Ireland – *Umwelt <> Galaxies > Space*

17:30-18:00 *Biosemiotics* Editorial Board Meeting

18:00-19:00 General Assembly ISBS

19:00-20:00 ISBS Board Meeting

June 8

Session 1: Biology and Codes
Chairman: Kalevi Kull

09:00 Alexei Sharov – *Dialogue between Code Biology and Biosemiotics*

09:30 Dan Faltýnek, Vladimír Matlach, L'udmila Lacková – *Text Dependency between Length of Protein Secondary Structure and the Protein Size*

10:00 Andres Kurismaa – *Associative Semiosis and Epigenetic Inheritance of a Neural Code: Theoretical and Biosemiotic Problems*

10:30 *Coffee Break*

Session 2: Organisms, Dynamics and Functions
Chairman: Karel Kleisner

11:00 Henrik Nielsen – *How Much of the Human Genome is Functional?*

11:30 Jean Stevens – *The Epistemological Stakes of the Biosemiotic Approach*

12:00 Luis Emilio Bruni, Franco Giorgi – *A Heterarchical Semiotic Perspective to Multimodal Perception and Cognition*

12:30 Alin Olteanu – *Learning as Adaptation*

13:00 *Lunch Break*

Session 3: Ethology and Cognition
Chairman: Malika Jara-Bouimarine

14:30 Merja Lina Marjanne Bauters – *Habits, Reflection and Experience in Learning*

15:00 Filip Jaroš – *Social Cognition of Captive Chimpanzees in a Biosemiotic Perspective*

15:30 Silver Rattasepp – *Animals and the Empirico-Transcendental Doublet*

16:00 ***Coffee Break***

Session 4: Zoosemiotics and Ethics
Chairman: Franco Giorgi

16:30 Aleksei Turovski – *An Attempt at a Zoosemiotic Approach to Ethological Parasitology*

17:00 Gerard J. van den Broek – *The Signs of the Hunter*

17:30 Yogi Hendlin – *Syllepsis and Particularism in Biosemiotic Ethics*

June 9

Session 1: "A Sign Is *What?*": A John Deely Memorial Symposium
Organized by Don Favareau
Chairman: Myrdene Anderson

09:00 Don Favareau, Paul Cobley, Kalevi Kull, Myrdene Anderson; discussion

11:00 ***Coffee Break***

Session 2: Historical Problems through the Prism of Modernity
Chairman: Luis Bruni

11:30 Francesca Dell'Oro – *Underwater Semiosis in Ancient Greek and Roman Thought: Sounds, Invisible Signs and Symbiotic Communication from Aristotle to Aelianus*

12:00 Lauri Linask – *Lev Vygotsky's Natural History of Sign Operations*

12:30 ***Lunch Break***

Session 3: Emotions and Interpretations
Chairman: Victoria N. Alexander

14:00 Pauline Delahaye – *The Semiotics of Emotions: Studying a Final Frontier of Living Beings*

14:30 Naoki Nomura, Tomoaki Muranaka, Jun Tomita, Koichiro Matsuno – *Time as Linguistic System: E-series Time for Bio-Synchronicity*

15:00 Petr Tureček, Jakub Jelínek – *Project Cicero: Semantic Pareidolia Introduced*

15:30 ***Coffee Break***

Session 4: Biosemiotics and Human(ities); Conclusions
Chairman: Don Favareau

16:00 Evelina Deyneka – *Ideograms of the Mind: Between the Language of Thought and Neurophysiological Semiotics*

16:30 Aleksandra Čalić, Stephen J. Cowley, Mitja Peruš – *Embodied Cognition: Tooth Grinding as a Cognitive-Semiotic Mode of Action*

17:00 Stefano Carlucci – *The Red Side of Anthropocentrism or the Right of Life and Death*

17:30 Sergey V. Chebanov – *History and Results of Development of Biosemiotics*

18:00 Concluding Remarks

19:30 ***Social Dinner on Boat***

June 10

Guided Tour at Zurich Zoo
(optional)

PRE-CONFERENCE DAY

Biosemiotics, Biology and Linguistics in their History

(UNIL, INTERNEF BUILDING, 275)

To See the Forest behind the Trees: "Biological Bias in Literary Criticism" from Formalism to Moretti

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With the rapid digitizing of old texts and exponentially growing access to new ones in the last decade, there has been a qualitative increase in "eye strain" for philologists. Ease of access risks becoming "information overload" and the withering away of the ability to "see the forest behind the trees". This purely technologically provoked abundance of texts cannot be addressed by recommending perseverance and cultivating a love of reading. This technological expansion instead requires passing through it without being repressed, and subjectivizing it. What is needed is a "knight's move", as formalist Viktor Shklovsky phrased it. "Distant Reading" – the method of Franco Moretti, who calls himself a quantitative formalist – can be regarded as just such a technical invention.

For Shklovsky, the *car* modelled the action both of narrative's mechanism and theoretical inspiration.[1] We can say that like the "invasion" of industrial technology into life in the early 20th century, the onset of post-industrial data exchange and information techniques conditions many contemporary analytical gestures. And "quantitative formalist" Moretti, certainly a user of mobile interfaces, offers something like a methodological gesture of *zooming*. However, to yield *graphs*, *maps*, *trees* and other visual fruits of analytical methods, one must have as a basis empirical data and the methodology of the natural sciences.

Moretti senses a fundamental problem posed by "the adoption of the natural sciences as a conceptual model for social history", although when it comes to the details, he is "squarely on the side of the natural sciences".[2] Such a synthesis has rich precedent in the history of science. Schleicher in "The Darwinian Theory and the Science of Language" brings into linguistics the concept of the law from biology.[3] Moretti also refers to Darwin's model as applied to the evolution of languages: "The tree, the phylogenetic tree derived from Darwin, was the tool of comparative philology: language families branching off from each other [...] in order to branch off from each other, languages must first be separated in space, just like animal species […]".[4]

With regard to literary evolution, Moretti also regularly appeals to Darwinian phraseology. He speaks about key stages in the transformation of the device as a point of "branching", of discovering "the important Darwinian aspect of literary history: the moment of morphological changes, when a particular author conducts himself like genre as a whole: uncertainly", and says, finally, "evolution explains Doyle's survival through the superiority of his prose's formal design"[5] and "readers' taste serves as the equivalent – or analogue – of 'environment' in evolutionary thought".[6]

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[1] Cf. "Invasion of technology into the very fabric of existence, change the language, habits, routine structure, largely contributing to the formalist theory supplied the design problem above all of the essential issues" (Levchenko 2014, p. 263).
[2] Moretti 2013, pp. 121-122.
[3] Schleicher 1863 [1983].
[4] Moretti 2013, pp. 59-60.
[5] *Ibid.*, p. 144.
[6] *Ibid.*, p. 40.

The fact that Moretti is inspired by evolutionary theory in his description of the laws of literary development merits comparison to Tynianov's "literary evolution." In Doyle's hands evidence is transformed "from mere ornament into a puzzle-solving mechanism: he finds a *new use* for it – 'refunctionalization', as the Russian formalists called it".[7] The main thing that Moretti inherits from the formalist project is continuing their search for what causes legacies to pass "from uncle to nephew." What truly distinguishes him is that he works with large amounts of data and, consequently, seeks the mass subject of literary evolution: "readers select, and then markets magnify".[8]

It may seem that in this Moretti goes beyond the bounds of permissible variations on the formalist method, when he absolutizes such a crude and, one might say, "Darwinian" selection factor for literary forms, destined to survive as the hedonism of an audience's taste. But at a certain stage of the discussion about composition and structure, the formal method was criticized for its "biological bias in literary criticism",[9] concentrating – according to critics – on almost physiological processes of individual perception of literary form and ignoring its social and communicative aspects. This allows us, in other words, to take seriously the biological metaphor and even a long history of "the biological bias" in literary theory.

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[7] *Ibid.*, p. 75.
[8] *Ibid.*, p. 146.
[9] Cf. more in Fore 2006.

Animal Studies in Linguistics

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Animal studies, comparative psychology, or ethology played a crucial role for the cognitive revolution in linguistics in the 1950s. It was the work of Jakob von Uexküll, Konrad Lorenz, and Nicolas Tinbergen that influenced the development of Chomsky's biolinguistics and Sebeok's agenda from linguistics to zoosemiotics and eventually (bio)semiotics.[1]

While mainstream linguists, along with mainstream funding agencies, welcomed and supported long-term experiments with primates learning sign-language and artificial symbolic systems, it was clear to Sebeok and Chomsky that there was nothing to be learned about human language or the cognitive capacities of primates. It took several decades until primate researchers reoriented their focus towards the species-specific sign-systems, vocal and non-vocal, and primates were no longer brought up in the homes of researchers, but instead studied in their more species-appropriate habitats such as animal sanctuaries or in the wild.[2] This very basic premise that each animal species has a specific way of interacting with its environment is articulated in Uexküll's early 20th century writings, and has now safely made it into the mainstream.

The most popular studies in animal behavior unquestionably concern dogs. Many popular books have now articulated a revised understanding of the signifying abilities of dogs to dispel false assumptions concerning dogs' understanding of human language (e.g. McConnell, Horrowitz). In her bestselling book *Inside of a Dog*, Alexandra Horowitz actually attributes her approach to studying dog behavior to the work of Jakob von Uexküll. Horowitz explains the perception and action profiles of dogs for a better understanding of how they signify and interpret human signs. The question of how dogs process human language has recently also been addressed by a team of Hungarian neuroscientists.[3] Their fMRI experiments with dogs suggest that dogs process the meaning and affect of human speech separately. On this issue, Alexandra Horowitz[4] makes an important observation that is also inherently biosemiotic, namely that the abilities of one individual dog cannot be representative of an entire species.

There is a fortunate ethical shift that goes along with this reorientation that puts the (bio)semiotic perspective at the centre of animal studies. It is not a coincidence that the same era that has brought us the rediscovery of Jacob von Uexküll in a popular book on dog behavior more than half a century after Chomsky and Sebeok have discovered his work in the 1950s, has brought the end of many animal shows in theme parks and circuses. Orcas are no longer bred in captivity to perform at *Sea World*. In fact, *Sea World* has terminated all orca shows as of 2016. Circus elephants, lions, and tigers are retired to sanctuaries by the dozens. Are these signs of a changing attitude towards other animals that Andreas Weber has articulated in his book *Alles fühlt* (2007)? Is humanity reevaluating its relationship with other species on a much larger scale than (bio)semiotics or ecolinguistics have anticipated?

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[1] Cf. Augustyn 2009; 2013.
[2] E.g. Halloran 2012.
[3] Andics *et al.* 2016.
[4] Horowitz 2009, p. 8.

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Tamaz V. Gamkrelidze's Vision on the Structural Isomorphism of the Linguistic and Genetic Codes

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The problematic of language and genetics has been written about extensively. However, Tamaz V. Gamkrelidze's point of view brings a new perspective to the subject by pointing to the structural similarities between the linguistic and the genetic codes. Indeed, in "Marr's glottogonic theory and the structural isomorphism of the genetic and linguistic codes" there is an unusual and disputable, but elegant (and somehow poetic) thought, which consists of questioning the possibility that our communication system might have sprung up from our genetic code. Also, his text is focused on the glottogonic theory by Nikolaj J. Marr who wrote about the origin of language.

Gamkrelidze begins with an analogy between the linguistic and genetic codes. He starts by reminding us that "the heredity matches the information logged all along the chromosome, by the means of a given chemical alphabet",[1] which is made of only four chemical bases. Concisely, the four bases are meaningless alone, just like the phonemes in language. The four basics combine to form a "triplet", the phonemes will form a word. The "corpus" of 64 triplets, which is the material of a gene, is in a way the "vocabulary" of the genetic code. Finally the triplets are put side by side to create a gene, just like words to create a sentence. The structural analogy is striking. Gamkrelidze is not the only scientist who sees an analogy between language and genetics, Suren T. Zoljan also sees the genetic code as a hypertext.

With regard to the cause of this isomorphism, Gamkrelidze presents the quarrel between Roman Jakobson and François Jacob. According to F. Jacob, the isomorphism is a mere structural comparison. R. Jakobson defends that living beings are unconsciously able to decipher the genetic code, and thus could have been influenced by its ability when it came to produce a new code. Then Gamkrelidze highlights the facts that Marr states in his glottogonic theory that any text emanates from distortions of four phonemes, which links one more time the two codes' structure. Moreover, this structure is present in numerous cultures and other codes. Could the genetic code, as Jakobson and Gamkrelidze suggest, be the spring of our means of communication and comprehension of the reality? Could it be the key to a universal language or to a universal system of meaning?

Of course this theory is appealing, because of the elegance and the poetic quality of its universality. Furthermore, the idea of a perfect universal language based on these principles could be a track of research. Nevertheless, the way he uses the analogy is arguable, because even if the analogy itself is coherent, it could also be applied to any system made out of smaller elements. Furthermore, assuming that Jakobson's hypothesis is correct, how exactly human beings use this unconscious knowledge to create a new code remains mysterious, unexplained, and probably unexplainable. Our purpose is to put forward an analysis of this theory through the prism of the quarrel between Jakobson and Jacob.

[1] Gamkrelidze 2005, p. 139.

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Translation Theory's Conceptual Apparatus: Do Biological Terms Represent Real Cognitive Processes behind Translation Procedure? (A Look at Examples in Andrey Fedorov's Works)

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Andrey Fedorov, whose scientific personality was formed in the first third of the 20th century, is often called a founder of the Soviet linguistic translation theory. In 1920-1940, a period considered as formalistic, the scholar places invisible, content-related aspects of the translation procedure in the centre of his theoretical interests and tries to build a theory based not only on observable phenomena, such as original and translated texts, but also on reflecting on processes taking place in translator's mind. His main reasoning turned around the questions: "Why?", "What for?", "What is the function of…?" Thus, Fedorov sought links between form and sense in translation procedure as a specific heterogeneous system of signs.

The unconventional approach, introducing concepts absent in linguistics, needed a particular terminology. That is why in Fedorov's articles about translation one can find such terms and notions as "transplantation", "heterogenic resemblance", "projection", "selection", "series correlation" and other, mostly biological, concepts.

In my presentation, I shall try to demonstrate that the main reason of creating this linguistic-biological conceptual apparatus was, for Fedorov, to include a semiotic constituent, explaining mental transformation processes, in his theoretical reflections.

The Metaphor of Life in Charles Bally's Work through the Prism of (Bio)Semiotics

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The concept of life in Charles Bally's work is a recurring one. Not only did he publish an entire book about life and language – *Le langage et la vie*, 1913 (first edition) – he also regularly referred to language as not only a part but also a form of life. The linguist, famous for co-publishing Ferdinand de Saussure's *Cours de linguistique générale* in 1916, together with Albert Sechehaye, and several other books of his own work, writes about language in itself and the different languages as having a life or lives that mimic that of human beings and societies. Thus, language may become something that is born, lives, develops (and therefore maybe rises, too) and eventually dies. As little original as this may well sound, does his point of view reflect something else than his cultural entourage of the early 20th century? The sociological aspect of the question taken partly aside, we will attempt to see if this view of language encompasses something more, perhaps specific to his research, or if it is a metaphor that helps him talk about language, that is, that he uses as a tool and a mean to speak about his scientific object. In particular, we shall concentrate on Charles Bally's special focus on stylistics; one that he already has at an early stage of his research (his *Traité de stylistique française*, 1909, was published before his *Le langage et la vie* and the *Cours de linguistique générale*). While Bally attempts to study the affective components of organized language (in particular, insisting that it is impossible to verbally communicate without any affective aspect to one's utterance, which seems to be closely connected with his biological view of language), we shall try to understand the nature of this "affectiveness" through the prism of (bio)semiotics, describing it as a particular semiotic object.

Do the Names of Colours Depend on our Visual Perception Skills? A Historical Review of the Problem

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This paper presents a critical review of a number of research works that have attempted to explain the origins of colour names in natural languages. On the one hand, referring to the biological aspect, we can suggest that people's visual perception skills have been evolving with time. In fact, there were no names for several colours in ancient languages. Ancient Greeks, supposedly, did not have any names for the colours which they could not perceive due to their underdeveloped visual system. For instance, Homer in *Iliad* and *Odysseus* or Pindar in his poems use extraordinary combinations of nouns and colour adjectives as *wine-dark sea* or *violet-coloured deep* owing to their colour vision deficiency (colour blindness).

On the other hand, we can suggest that the richness of colour vocabulary varies depending on the "degree of civilisation".[1] In particular, there are few colour names in the languages of "primitive" societies, with majority of them being "vague and indefinite".[2] Even if we accept the idea of the colour deficiency among Ancient Greeks, (there is a myth about Homer's blindness), does one need to assume that "primitive men" were unable to perceive or distinguish some colours without a name in their vocabulary too?

Our resumptive review of the previous research explaining the origins of colour names in various languages leads to a conclusion that the biological and cultural aspects coexist, but the influence of culture on a language is mostly decisive in colours naming.

In the mid-twentieth century, B. Berlin and P. Kay "proved"[3] that colour names in various languages appear in a predictable order (their theory is based on Geiger's sequence). They explain it with the "focus" of a language, i.e. a human belief that some shades are more typical examples of a given colour than others. This pattern confirms that intuitive visual perception of eleven main colours is identical for people with different mother tongues as well as for people from different historical periods.

It seems most likely that the colour vocabulary is determined not by biological factors but primarily by cultural ones. Humans identify all the colours, but do not always give them names. Rivers found out that the indigenes from Murray Island use *golegole* for 'black'. It is derived from *gole* for 'cuttlefish'. Rivers presumed that this word alluded to animal's dark ink. Similarly, *mamamamam* ('red') was drawn from *mam* ('blood'). Apparently, these colour names (and others) are related to the objects that have the same colour in nature. A. Wierzbicka considers colour names being motivated by the connection between objects painted in this colour and the universals of our every-day life, of the environment we live in. Therefore, both signifier and signified become logically constructed and semantically interdependent despite arbitrary nature of sign proclaimed by F. de Saussure. For example, 'blue' is a signifier and two universals, sky and water, are signified. We resort to semantic analysis in order to reconstruct this effaced connection. (Although all rules always have exceptions.)

In the end, one should search for the origins of colour names in cultural aspects and customs, rather than in the features of human visual systems. However, there is no definitive answer to this dilemma.

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[1] Bastian 1861-1862 [2004], quoted in Deutscher 2010, p. 59.
[2] Deutscher 2010, p. 88.
[3] Berlin, Kay 1969.

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Linguistic Teratology

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Like biology, linguistics had its monsters. This is one of the manifestations of the naturalist and biological paradigm that impregnated linguistics in the 19th century. If in biology monsters were considered as such for their morphological variation or their equivocal appearance that ran counter to the established laws of life, in linguistics monsters were phenomena that were not theoretically foreseen and that had, therefore, no place inside the linguistic naturalism. This presentation is dedicated to the discourse on two categories of "linguistic monsters": the artificial languages and the mixed languages, such as creole languages. I will focus on the reasons why these languages were considered as monsters, one of them being the imagined or idealized nature of linguistic signs in the naturalist linguistic paradigm. Will be also analyzed the evolution of the discourse about these "linguistic monsters" and the role it played in the development of linguistics.

A "Biolinguistic" Novel through the Prism of Reflections on the Limits of Biosemiotics: Analyzing *The Embedding* by Ian Watson

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Conventional and (often) vague, the limits of any discipline become, at one or another moment, an object of reflections and discussions within the framework of research communities. Where are the limits of biosemiotics, the discipline which studies the production and interpretation of signs in the realm of living beings and which one of its leading representatives, Jesper Hoffmeyer, defined in the following way: "Biosemiotics is the name of an interdisciplinary scientific project that is based on the recognition that life is fundamentally grounded in semiotic process"?[1] Human beings, living organisms too, and their language (in the sense of a linguistic system) are not usually studied by biosemioticians. In particular, the line between biosemiotics and (bio)linguistics could be considered as follows: "biolinguistics is the study of biological preconditions of language; biosemiotics is the study of pre-linguistic sign systems".[2] However, there exist a number of cases which seem to be intermediate between biosemiotics and (bio)linguistics: for instance, how to consider the slurred "speech" of those behaving like madmen? Or the sounds produced by little children before they master one or another language fully? Or a hypothetic language of (once again) hypothetic humanoid aliens? All these examples are taken from *The Embedding* novel, written by the British science fiction writer Ian Watson (1973). At first sight, by its very content this novel concerns biolinguistics: in the centre of this book one finds the idea of Noam Chomsky's universal grammar and its importance for communication in general. But *de facto* Ian Watson introduces to his readers a whole set of scientific problems which could be considered as intermediate between linguistics and biosemiotics; their analysis shows that the distinction between these two fields of knowledge is conventional to a larger degree than the majority of contemporary scholars usually think.

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[1] Hoffmeyer 2008, p. 3.
[2] Kull, Velmezova 2015, p. 8.

Aphasia as a Semiotic Problem: Roman Jakobson's Point of View

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At the beginning of the 1940s, Roman Jakobson pointed out parallels between children's language development and aphasia symptoms. He proposed the hypothesis that we can observe a mirror image between children's language development and the impairments of aphasic speakers. He later tempers this hypothesis in 1955 in his essay "Aphasia as a Linguistic Problem", in which he shows the plurality of the signs of aphasia. Jakobson is one of the first linguists to offer a semiotic description of aphasia from a linguistic point of view. The purpose of this presentation is to present an analysis from a semiotic perspective of the classification made by Jakobson of the signs of aphasia.

It's in his essay "Aphasia as a Linguistic Problem", that he first pointed out a bipolarity in aphasia. Indeed, he reckoned that in order to classify the different types of aphasia, he had to identify which verbal behaviour is impaired by the aphasia. Therefore, he defined two types of disorder named contiguity and similarity. He used the fundamental opposition of functional linguistics (syntagmatic and paradigmatic axis) to analyse those disorders. In the first case, the disorder diminishes the extent and variety of sentences, in the second one, the aphasic loses the ability of code switching. Furthermore, Jakobson observed that "there's only one of the [disorders], similarity or contiguity, that is impaired".[1] In other words, the aphasic patient presents only one of the disorders, the other one being unimpaired.

When in 1963 Jakobson focused once more on the problematic of aphasia, neurologists had made several new studies on the topic. So he decided to propose a classification of aphasia disorders based on the interpretations of the Russian neuropsychologist Alexander Luria, who is known for his psychological case study and was one of the founders of cultural-historical psychology. He attempted to contrast Luria's six aphasia types in terms of three dichotomies. The first bipolarity is the one he had already pointed out in 1955: contiguity and similarity. The second one concerns limitation versus disintegration and the third contrasts sequence and concurrence. Through his analysis, Jakobson managed to "prove" the connection between the six aphasia types and the cerebral localisation of the disorder. Thus, he is considered a pioneer, being the first linguist to point out the importance of the aphasia in order to understand the neurologic aspect of the language. Jakobson's works on aphasia are still regarded nowadays as valuable, because they show the necessity of continuing to study aphasia through linguistic, biologic and semiotic points of view.

[1] Jakobson 1955 [1969, p. 112].

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MAIN PROGRAMME

(UNIL, INTERNEF BUILDING, 275)

Siri Fails the Turing Test: Computation, Biosemiosis and Artificial Life

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The ubiquity of technologies using artificial intelligence (AI) – Google learning algorithms, Apple smart phones and weaponized robots – should give us pause. What is intelligence? What might be the difference, if any, between intelligence in machines and organisms? Both can obtain goals, set either by evolution or design. Machines can be programmed to perform computations, seek objects, read signs, and even preserve themselves. But do organisms and machines use different methods for learning, remembering and interpreting in order to perform these intelligent actions? Artificial Intelligence (AI) designers try to mimic human brain capabilities with "self-learning" neural networks trained by selection processes. Yet decades on, AI still fails the Turing Test. While computers use *codes* and develop *algorithms* apart from contexts, living cells use *signs* and develop *semiotic habits* within contexts. This difference, I argue, is partly due to the collective activities of biological neurons that produce traveling waves, which, in turn, further constrain neural activity. It appears wave patterns function as contexts for the local connections. At the time of his death, Alan Turing was investigating the organizing role of emergent wave patterns on biological development, dappled animal fur patterns, root growth, and embryonic differentiation. Had he lived to continue this work – which thirty years later was revived as Artificial Life (AL) – he might have reoriented AI research, which has become merely a tool for stereotyping and regularizing, not thinking.

Adding a biosemiotic perspective to AL research, I investigate how the behavior of individual neurons may lead to emergent patterns at the collective level. How do neurons learn to organize with other neurons? Origin of life researchers ask similar questions about how interacting molecules can "program" themselves or "optimize" their "algorithms" so that functional choices can be made, resulting in collective outcomes that can be retained by natural selection or not. This is the wrong question. I argue that functionality arises when semiotic transformations at the lowest levels begin to flow efficiently and form a semiotic cycle. A semiotic habit is a machine that resets itself. Instead of attempting to hypothesize about how neural *algorithms* may be trained by the environment with a more or less logical or statistically significant selection process, I propose, using Crutchfield's ε-Machine concept and Turing's morphogenesis research, that *semiotic habits* simply flow to the lowest possible energy state, following the stochastic resonance of similar and proximate signs. This fluid and cyclical nature of biological computation distinguishes it from artificial machine computation.

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A Serious Case of Approach-Avoidance: Biosemiotics Meets Anthropocene

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Humans live in and through storying, as does science. Stories, like bionts, link up potentially in all angles of space and time, drawing on a compost of ideas. This story is called "anthropocene".

The very notion – that humans now so overwhelmingly shape their earthly substrate that the situation calls for a separate epoch, the Anthropocene, named by and for our species – strikes many as a stroke of hubris. Within and without semiotics, with empirical and fantastical data – the literature shuttles from alarm to shame to pride to intervention to hope and back again. Regardless of whether humans are to take credit or blame or something else, for or from the Anthropocene … this much is clear: the Anthropocene is Us.

Geologically, the Anthropocene could have commenced when the earth itself registered inadvertent signs of one key species: a surviving Pleistocene megafauna first tottering and then gaining foothold at the top of its trophic level, aided and abetted by linguïculture, sometimes leaving material traces. Consequently, the Anthropocene and Holocene might as well be coterminous, dating from 11,700 YBP, and also with the beginning of steady increases in human populations around the Neolithic.

That the Anthropocene has not been pinned down, and that it evokes such a panoply of responses, makes it a veritable shape-shifter, a Trickster for our times, bearing the message that a little bit of hubris goes a long way! Humans stumble on their own blinding confidence, in their haste and on their waste. A condition of ecomyopia surfaces when it comes to our species being unwilling or even unable to take stock of the state of our collaborating substrate and sibling species. Somewhere in between the historian and the earth scientist will be the ecologist, dealing with the relations that obtain within the significant surrounds of living things, their Umwelt. Contemporary discourse about "grand challenges" appears to reduce them to economies rather than to ecologies. Rorschach or quicksand-"sustainability", another buzzword of our times, decorates the surface of this literature, in virtual defiance of ecology. Is sustainability a goal, a fantasy, or just an oxymoron? Humans are inclined to pat themselves on the back for the magnitude of their problems and for the cleverness of conjured solutions, while using the other hand to shield the eyes from the bottom lines advancing from all directions.

Ever since humans emerged on the planet, they have evinced an exuberance that has left more signs than humans themselves have ever mustered the courage to read. It seems evident that humans do drive the Anthropocene, whether it's demoted to be absorbed by the Holocene or not. So little of the literature, though, bothers to take the growth in human numbers seriously, as the more concrete driver of human impacts on their Umwelten and on the planet, if not the cosmos. This scenario is ripe for biosemiotics.

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Habits, Reflection and Experience in Learning

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The need to reconsider design of applications for learning has emerged from the increased use of mobiles, wearables and Internet of Things (IoT or Internet of Everything IoE). The common emphasis has been on re-evaluating and structuring human interaction within environment towards sense-making processes. In learning, specific needs stress for changes, such as: the pressure to re-learn, update skills and knowledge especially in work environments.[1] The challenge is to understand how workers learn from experience and reflect while working.

Embodied cognition,[2] the extended phenomenological-cognitive system[3] and the deeper role of feelings and emotions in decision and meaning making[4] have had an impact in the designing of applications for learning. These different disciplines provide a worthwhile but varied view on the importance of experiences in learning. For instance, the extended cognitive systems are heterogeneous, composed of brain, body, and niche. These are non-linearly coupled to one another. Brain, body, and niche are in interdependence amongst each other. The system allows explaining extended cognition without resorting to representations or computation models of reflection and thinking. It means that cognition and conscious experience are understood as a single phenomenon. However, only a few have pondered in depth the previous discourses on experience. One such overlooked school of thought is pragmatism.

I claim that it is not possible to skip the tangibility of learning and meaning making. I will emphasise the combination of John Dewey's two types of experiences, which are present in Dewey's reflection cycle and which can be explained using Charles Sanders Peirce's Phaneroscopic categories with emphasis on doubt and collateral experience. Experiences are seen from two perspectives: the "qualitative immediacy"[5] of experience, taken as the dominant form of experience and reflective experience, which is mediated by intelligence and knowledge. Reflective experience grows from the inadequacy and contradictions of the habitual experience and ways of action. I will first present learning approaches; such as knowledge building and creation that have already discussed experience with reflection. Then, I will draft a new view, which is based on pragmatism but uses the knowledge of extended phenomenological-cognitive system approaches. Focus should be on aiding reflection process, not in taking reflection away.

[1] FitzGerald 2012; Oppermann, Specht 2006.
[2] Shapiro 2014.
[3] Silberstein, Chemero 2012.
[4] Damasio 2001.
[5] Alhanen 2013.

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Biosemiotics of Sound and Silence: Interdependence and Value in a Noisy World

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In defining the "soundscape", composer and environmentalist R. Murray Shafer lamented noise as the "indiscriminate and imperialistic spread of more and larger sounds".[1] The world, according to him, was becoming noisier and, therefore, worse off – for human beings, at least. Similarly, more contemporary work in soundscape ecology continues to evidence the diverse ways in which sound and noise play vital roles in shaping the umwelten of individual organisms, through challenging or encouraging their semiotic relationships to allo- and conspecific species members.[2] Analyses like these work to understand how sound is related to and within environments, recognizing the potentially important role of semiotic analysis, though in other terms. Sound is considered as much more than a mere bioacoustics phenomenon but instead as a meaningful transaction of signification. For example, acoustic ecologist Barry Truax[3] positions soundscapes as systems of relations of information and communication: as semiotic systems. Similarly, Almo Farina recognizes the importance of integrating approaches including bioacoustics and landscape ecology with biosemiotics to fully understand the soundscape.[4] Yet neither Truax nor Farina elaborate much on the nature and place of biosemiotics within the study of sound and noise in the world.

I argue that biosemiotics is uniquely situated to help clarify and refine our thinking about sound and the soundscapes they shape. My presentation of this argument will consist of two parts. First, I will draw out a biosemiotic analysis of sound and soundscape in juxtaposition to existing philosophical or bioacoustical theories about sound and its relations. I will conclude that a biosemiotic account of soundscape ecology offers not only a helpful frame from which to better understand sonic relationships generally, but also a helpful case study from which to better understand the work of biosemiotics as it relates to the interdependence of living systems more specifically. Secondly, I will anticipate the implications this view of interdependence (which is already normatively grounded as a means of environmental conservation) has for an individualistic biosemiotic ethics that privileges an organisms' web of semiotic relationships as a key ethically relevant characteristic. This analysis is based on previous work arguing for a biosemiotic ethics that not only assesses moral responsibility of the semiotic animal[5] but also evaluates the moral worth of individual organisms based on the complexity of their umwelten.[6] That ethical end, on the analysis offered in this presentation, is the heart of the interdependence of sonic relationships as understood in biosemiotic terms. Soundscape ecology, so considered, can be understood as biosemiotics in that it draws together the phenomenological biology of Jakob von Uexküll with the rich semiotics of Charles S. Peirce. What this rejoining accomplishes is, at its heart, normative work: it gives ethical ground to why the study of sound *matters* both to and for the organisms that hear and make it. The world of sound is the world of semiosis, driven by the

[1] Shafer 1994, p. 3.
[2] Cf. Krause 2012.
[3] Truax 2011.
[4] Farina 2014.
[5] Cf. Deely 2008; Petrilli 2006.
[6] Beever 2012; Beever, Tønnessen 2015.

living sounding animals that find meaning in it. To play on MacBeth, theirs is a world of sound and *furry*, signifying *everything*.

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The Signs of the Hunter

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Hunting and gathering formed the basis of the lives of our prehistoric ancestors. Though both have hardly the same position in our modern day world, and are hardly able to sustain present-day humans, the emotional and symbolic significance of hunting in particular almost has remained the same for millennia.

There is hardly a domain to be found wherein so many "atavistic" signs are still to be found, harking back to the mists of our times. The total array of signs in hunting is overwhelming; ranging from iconic, indexical to symbolic signs, used in visual, aural and gestural communication with both man and beasts.

The signs used are either used to convey messages to animals or messages to other humans. But among all the signs used by the hunter, most of them involve interspecies communication, signs exchanged between man and animal – zoosemiotics – thus also falling within the realm of biosemiotics.[1] These signs "echo" animal communication, just like mimicry does within the animal world,[2] and camouflage among both hunters and the military.

Various sign vehicles are used, ranging from vegative to metal and bodily "tools". It will be explored which signs and which tools are used for the various types of communication with either animals or humans.

I will explore a limited number of the facets used at the hunt – for exploring them all will go widely beyond the limits of a paper – while trying to show both the broadness of the various fields in which explicit signs are used and their, frequently hidden, meaning.

The analyses will be limited to Western-European hunting practices.

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[1] Cf. Kull 2011; Sebeok, Umiker-Sebeok 1991; Van den Broek 1984.
[2] Maran 2017.

A Heterarchical Semiotic Perspective to Multimodal Perception and Cognition

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We have argued that multi-level semiosis requires a kind of processual organization that may be better described as being heterarchical. Theoretically, the challenge arises in the temporal domain, that is, in the developmental and evolutionary dimension of dynamic semiotic processes. In this direction we have discussed how levels, domains and orders of magnitude, on the one hand, and synchronic and diachronic processes, on the other, contribute to the overall organization of every living being. To account for such multi-level organization, semiotic freedom is assumed to be a scalar property that endows living systems at different levels and domains with the capacity to ponder selectively the overall structural coherence and functional compatibility of their heterarchical processing, which is increasingly less conditioned by the underlying molecular determinism. In this presentation we will exemplify our approach by examining the epistemological assumptions of bottom-up and top-down approaches to perception and cognition.

Embodied Cognition: Tooth Grinding as a Cognitive – Semiotic Mode of Action

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Bruxism is the bodily habit of automatized clenching or grinding of the teeth with two distinct patho-physiological entities: sleep (SB) and awake bruxism (AB) that differ in their etiology and phenotypic variance. AB is usually manifested as mere clenching and is linked to stress and psychosocial causative factors. SB exhibits variable phenotypic clusters and is mostly linked to sleep physiology and factors that disturb it (nervous system disorders, substance use, etc.). Both types may have an epi-genetic basis. Recent medical theories of the etiology of bruxism suggest the central (CNS) regulation of certain pathophysiological or psychological pathways, but exact mechanisms underlying them and their association to environmental influences have not been identified yet. Although bruxism used to be classified as a parafunction, studies suggest that it may have a beneficial physiologic function in stress management (cortisol lowering) and achieving nocturnal airway patency. In the "Social Construction of Bruxism", presented at last year's Gatherings, it was argued that – in addition to mechanistic biotechnological methodologies – up-to-date use of biosemiotics insights can lead to a more comprehensive understanding of bruxism. In this article we propose a specific theory that explains how bruxism could be explained as a cognitive-semiotic phenomenon and present the possible experimental ways of investigating it.

Through different theories we have explained bruxism by integrating biological, social and environmental dispositions as a co-evolutionary eco-psycho-social bodily structuring. On such a view bruxism becomes a complex cognitive-semiotic means of engagement. In this presentation we will use the principles of *perceptual cognitive theory* to propose that bruxism can be investigated as a truly cognitive-semiotic process. We will further back this association between bruxism and *perceptual symbols* (PS) with Peruš's model of *bionetworks*, which could further serve as an explanatory and research model of how PS could be specifically applied to bodily mechanism and functions.

According to the Barsalou's theory of perceptual symbols, sensory-motor phenomena can serve as both sources and manifestations of what he calls the *perceptual symbols* that underlie perception and cognition. PS are schematic counterparts of the perceptual world that, while usually unconscious, can also have conscious manifestations. In perceptually grounded cognition related perceptual symbols are organized into *simulators* within broader categorical *frames* that allow the cognitive systems to construct specific simulations of an entity or event in its absence (or presence). Simulations compared to the original perceptual event or object are usually distorted and vary as they encompass the symbolic and embodied variability of the existing world.

Applied to the case of bruxism, such variability could clarify the difference in etiology and phenotypic variance between the two types of bruxism. By hypothesis, AB is the original sensory-motor response to environmental clues and SB the functional simulation. Since scientific studies associate AB with stress, explicit psychometric experiments associating AB with cognitive or emotional processing of external / internal events could potentially establish AB as a corporal manifestation (a sign) of perceptual cognition. On this view, SB would mark its adoption and incorporation into the body's functional physiological repertoire. This is broadly in line with Barsalou's theory of perceptual cognition that he grounds in propositional simulation of the PS by establishing its reference as well as sense. More specifically, the latter represents the correctness, appropriateness (trueness) or functionality of the simulated proposition (or sensory-motor event) within a given context. However, the hypothesis also reaches beyond perceptual symbol theory by positing that bruxism in a form of semiotic engagement can take on cognitive-semiotic functions for the person in question.

The Red Side of Anthropocentrism or the Right of Life and Death

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> "Dream the world. Not in this pallid shadow of reality. Dream the world in the way it truly is... Dreams shape the world."
> Neil Gaiman, *A Dream of a Thousand Cats.* Burbank (CA): DC Comics, 1990, p. 22.

With these words a mother who suffered the kidnapping of her newborn children, entertains a small crowd of listeners, inviting them to rebel and overthrow the unacceptable form of *social reproduction*,[1] which allowed such a crime.

Nothing particularly strange if it were not that this "orator" is a cat, a mother who expresses the unbearable pain that has led her to leave her safe home and abandon forever the condition / subjection typical of every pet.

In her impassioned harangue the cat urges the audience to join in a collective dream, in fact, according to the counsel of a strange black cat that she has met in a dream immediately after the disappearance of her kittens, this would be the only way to overthrow the existing *ordre du discours*, as she says: "Dreams shape the world".

This narrative device, extracted from the eighteenth episode of the graphic novel "The Sandman" by Neil Gaiman, can be considered a sort of "amplified declination" of the play of musement.

In this work will be analysed some forms of animal treatment that can be considered doubtful.

All this to try to answer the question that the narrating subject (the mother) asked her interlocutor (the black cat) during their *unsubstantial discourse*: "Why could they take my children away from me".[2]

Any possible response to this question could help to identify the basic concepts useful to overcome the current model of interspecies coexistence and direct the complex web of relationships between humans and animals towards a mutual "answering comprehension" (Mikhail Bakhtin).

In a near future, perhaps, it will be possible to overcome the almost total coincidence between the right to life and faculty of speaking, and thus allow to the "words spoken" by other means to be listened to, although seemingly incomprehensible.

In this way the *obvie* will be by-passed, and a wider sense, akin to the one Barthes (1982) called *obtuse*, could be reached.

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[1] Rossi-Landi 1985 [2002].
[2] Petrilli, Ponzio 2003, p. 14.

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History and Results of Development of Biosemiotics

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Without repeating my presentation at the Gatherings in Biosemiotics 2012 in Tartu, I will discuss one issue that characterizes both the process of development of knowledge about biosemiosis, and its results.

In the history of the knowledge of living beings (LB) we can distinguish the following superparadigms that relate to different periods of development of human knowledge and culture in general:

– The totem-pagan worldview. It contains the totemic animal / plant and human interaction with these LB that occurs through language. Mythical bio-linguistics is an integral part of such cultures.

– The Antique logical-epistemic understanding of knowledge, that allows to formulate questions about the language of animals (anthropomorphic understanding), rational fixation of observations on this subject and systematization of such observations.

– The medieval Judeo-Christian view of the world as the Book (the Second Testament) that saw the practice of drawing up bestiaries, endowing animals with moral character and speech – starting Conversation with Animals (in What Language?) by King Solomon.

– The *allegories of* anthropocentric based Renaissance and Early Modern times, which represent various traits in people by comparing them to animal behavior, in order to show their true personality (cunning as a fox, coward as a rabbit).

– The descriptive naturalism of the 18th and beginning of the 19th centuries, where the opposition of nature versus culture grants language only to the latter. Plants and animals act as silent wonders.

– The functional examination of plants and animals allowed to identify the unity of living beings and to generate biology as an independent science, physiology (mid-19th century) and ecology (beginning of the 20th century), where it becomes necessary to consider inter organism communication (birds singing, mating behavior, means of maintaining social organization in flocks, etc.); human language is regarded as the most sophisticated tool of such communication. Consideration of the functional advantages of individual populations has led to the emergence of (neo-)Darwinism, which considered the perfection of mechanisms of communication as one of the selective advantages.

– Consistent exile anthropomorphism leads to the formation of ideas about reflexes (conditioned reflexes of the brain) as the basis of behavior (including the complex, in particular intellectual, activity). The psyche begins to be interpreted as an epiphenomenon of higher nervous activity, and human language, as the second signal system (as opposition to the first – [un-]conditioned reflex). Within this framework ethology, animal psychology, sociobiology and related subjects are formed and being developed (by the middle of the 20th century), each of which operates with concepts of signals, signs, symbols, etc., which is also reflected in the justification of semiotics by Ch. Morris.

– The discovery of the genetic code, the realization of its semiotic status (G. Gamow) make it clear that every LB has a semiotic nature. This is seen in the representation of linguistically released biology by H. Pattee or W. Nöth's idea that all life lies above the Umberto Eco's semiotic threshold. However, it can be comprehended differently. Bio-hermeneutics focuses on the multi-layer biological meaning, variability of its reception

(interpretation), bio-philology seeks to capture the history of compliance with the structural components, bio-linguistics deals with the use of the most technologically developed means of sign analysis to describe the specificity of linear sequences of the biological signs, biosemiotics traces the manifestation of semiotic universals in biological signs, bio-pragmalinguistics focuses on the study of how biological signs perform a particular action.

– Each of the versions of the understanding of biological signs asserts semiotic nature of LB, introduces non-anthropomorphic idea of meaning and is a methodologically correct answer to the questions of animals' language and the world as the Book. This is the main result of the development of the discussed area. At the same time, awareness of the semiotic nature of the LB is not to restructure all of biology (just like at one point Darwinism did for physiology, ecology, genetics, and molecular biology), so that without the use of semiotic categories it would have been completely impossible to produce any biological discourse. Therefore, a semiotic turn in biology cannot be considered fully implemented.

Is Observership the Same for Nature as It Is for Culture?

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This paper poses the question of the character of observership in respect of nature and in respect of culture. Observership seems to be self-evidently indigenous in the sphere of culture. To take a simple example, the practice of history, in excavating the hidden, revealing what is in plain sight and reconceptualizing documents from the past, seems to present a conclusive argument for the influence of the observer on the observed. Such observations about cultural phenomena would appear to give grounds for a "purely human" understanding of the world, thoroughly imbued with a particular kind of observership – in this case, what Williams[1] has called "the logic of history". Yet, such a theory of observership differs from that of, say, constructivism. Constructivism, particularly in its radical form[2] envisages a theory of the observer which amounts to a form of nominalism. A semiotic theory of the observer as posited by Williams[3] circumvents such nominalism by bringing with it a nuanced sense of the ability of humans to move seamlessly between mind-independent and mind-dependent semioses, as well as the consequences of the fact. But can such a theory, bound up in anthroposemiotics, really be extended to the domain of nature beyond mind-dependent human semiosis? Thure von Uexküll[4] considered it to be a distinct possibility and framed the matter in terms of the difference between naïve and participant observership. This paper will revisit these perspectives on observership, as well as more recent formulations on the matter[5] in order to foster enhanced precision in the understanding of the concept of "object" in natural worlds (characterized by semiosis with a lack of awareness that there are such things as signs) and cultural worlds (where awareness of the existence of signs *qua* signs is the very definition of that world).

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The Semiotics of Emotions: Studying a Final Frontier of Living Beings

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The expression of emotions has a special part in linguistics: emotions are one of the only, if not the only, few subjects that are almost impossible to express in a satisfying manner through the medium of language. The expression of emotions – perhaps, except for Jakobson's poetic function – is the failure of language. The semiotics of emotions is not redundant with traditional linguistics in this case; it is the only way for us to truly study emotions.

But emotions are problematic phenomena. They can only exist in the subjectivity of a living being, be they human or non-human (like Bekoff[1] or Christen[2] studied it). Therefore giving an exact, objective definition of what an emotion is – what is anger, jealousy, sorrow – is a tough task. Here as well, semiotics has an important role to play, as it makes it possible to study "the way I feel it" rather than "the way it is".

With this point of view, semiotics becomes a way to more efficiently study emotions, particularly in non-human subjects, through the examination of their semiosis. Bringing linguistics tools into biology field can help us build a new practice in biosemiotics. This practice meets, of course, the eternal question "is it exactly the same?", "can we call the anger, or the sorrow, of a chimp or an elephant the same way we call ours?" With the semiotics of emotions, with the study of those phenomena through a living being subjectivity, we can say that it is not a difficult question, but rather a question with no answer. That would require an objective definition, a fixed structure for a subjective, ever-changing matter. That would imply a full understanding of the phenomena taking place only in other minds' subjectivity. That's how this eternal question becomes a "final frontier".

Ferdinand de Saussure said that semiotics is the "study of the life of signs".[3] With the semiotics of emotions, like in biosemiotics in general, we can study the signs of lifeforms – more specifically, signs of an aspect of life that had been neglected so far – and put forward a new way to study emotions' related non-human semiosis. We can study emotion despite knowing that we won't be able to fully understand it. Accepting that we cannot fully know something is quite new in humanities' field – and perhaps in all fields. We do not like to point out something that is impossible for us to know, to understand; we dislike final frontiers. A few decades ago, quantum mechanics turned the way physics used to work completely upside down, showing that it was possible to study and work on things we were unable to ever understand. Maybe it is time for life sciences and humanities to walk in the physics' footsteps and to start working on their own final frontiers, despite knowing fully well that complete knowledge will forever be out of reach, rather than denying their existence.

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[1] Bekoff 2009.
[2] Christen 2011.
[3] Saussure 2002.

Underwater Semiosis in Ancient Greek and Roman Thought: Sounds, Invisible Signs and Symbiotic Communication from Aristotle to Aelianus

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The goal of this paper is to shed light on ancient Greek and Roman approaches towards "underwater semiosis", i.e. communication between animals living underwater, by collecting and commenting passages from ancient philosophers and other authors (in particular, Aristotle, the Stoics, Plinius the Elder and Claudius Aelianus) and by discussing them in the broader context of the ancient debate about communication and language as well as in the light of modern research about communication between underwater forms of life.

Research on animal communication in ancient thought[1] has devoted much attention to the study of the physiological apparatuses of animals and their implications for the articulation of sounds (can a specific animal produce sounds, voice, speech or even language?), to considerations about the ability of animals to imitate, teach and learn sequences of sounds (e.g., the nightingale that teaches its offspring to sing) and to the debate about the characteristics which differentiate human language from animal communication (conventionality of language, expression of emotions etc.). Compared to other animals (e.g. birds, whose ability to produce articulate sounds was considered very near to that of humans by Aristotle), underwater animals – from fish and crabs to mammals – are less represented both in ancient thought and in research about it. Nevertheless, the physiology of underwater animals and their ability to communicate also drew some attention: what kind of sounds (if any) can fish and other animals living in the water produce? Do they communicate like other animals? How do they communicate? Alongside sounds, tips of the tail, bites or other contact signals, Ancients even accounted of the presence of invisible signs (*semeiō tini atekmartō*, Aelian, *On the Nature of animals* 2.13) in order to explain underwater communication.

Ancient philosophers and writers integrated their empirical (or literary) knowledge about animal communication in their general views about communication and language as issues at the basis of various types of co-existence of individuals and questioned the origin of such practices (e.g., symbiotic relationships). A biosemiotic approach to ancient writings about underwater semiosis can not only give us new glimpses into the legacy of the Ancients, but also produce new stimulus for the interpretation of communication systems among various forms of life.

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Ideograms of the Mind: Between the Language of Thought and Neurophysiological Semiotics

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> "An old monk wrote the Chinese ideograph for 'mind' on the gate, window, and wall of his little house. Fa-yen thought it wrong and corrected it, saying, 'The gate must have the letter for 'gate', and the window and wall each its own letter.' Hsüan-chüeh said, 'The gate shows itself without a letter, so the window and wall need no sign at all.' GENRŌ: I will write the letter 'window' on the gate, the letter 'wall' on the window, and the letter 'gate' on the wall."
>
> "46. The Ideograph for Mind", in *The Iron Flute*: 100 Zen Kōan with commentary by Genrō, Fūgai and Nyogen. Translated and edited by Nyogen Senzaki and Ruth Strout McCandless; illustrated by Toriichi Murashima. Ruthland, VT – Tokyo: C. E. Tuttle, 2011 (1st ed. 1961), p. 55.

Since the discovery of the possibility to communicate with some post-coma patients with disorders of consciousness, due to the fMRI,[1] the philosophers of mind, clinicians and scholars specialized in neurosciences have got an opportunity to reconsider actual theories of consciousness.

The attempts to contact the subjects in so-called "locked-in syndrome"[2] have reactualized the old problem of searching for "languages of thought"[3] both from clinical and philosophical points of view.[4] In its updated neurophilosophical version, this problem has two aspects.

The first one is related to the diversity of types of consciousness[5] and thus to the uncertainty about finding exactly those signs of its presence which are being searched for, depending on what "channel of communication" is used to access the subject's mental processing (behavioral assessment, neurological examination, neurophysiological methods, neuroimaging).

The second one, which correlates with the first one in this context, is related to the diversity of "languages" that could be used to try to establish a "communication" with the subject, depending on the level and type of target consciousness. For example, in partial locked-in syndrome, despite the paralysis of all voluntary muscles, vertical eye movements and blinking are still possible. As well as even in some vegetative states, the evaluation of awareness is possible employing eye-gaze tracking systems,[6] which are much less expensive than more accurate fMRI and PET neuroimaging methods.[7]

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[1] Monti *et al.* 2010.
[2] Roquet *et al.* 2016.
[3] Fodor 1975.
[4] Deyneka 2015.
[5] Block 1998; Lycan 1996.
[6] Kunka 2012.
[7] Stender *et al.* 2014.

The most challenging projects nowadays are related to the idea of decoding connectome structures underlying the language and speech processing as such.[8] In particular, there is a hope that, in the future, this would probably even allow to create the speech synthesizers for patients with neuromuscular and other diseases, or functional conditions, in which mental language functions are preserved, but the subject is unable to realize them due to some other somatic or neurological reasons.

In our paper, we shall correlate these new neuroscientific empirical findings with the existing philosophical theories of mind to see, in connection with the problem of "mental languages", what further developments are possible today, in the field of cognitive studies.

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[8] Fuertinger *et al.* 2015.

Text Dependency between Length of Protein Secondary Structure and the Protein Size

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Already Kant in his *Critique of Judgement* argued that in living beings, not just the parts form the whole but also "the whole may conversely, or reciprocally determine in its turn the form and combination of all its parts".[1] With this observation, Kant tried to explain the compositional difference between the living beings and cultural artefacts, between living and non-living, a topic that has been studied in biosemiotics since its beginning.

In natural language, similar relations of reciprocal influence between the whole and its parts exist and they have been described mathematically by Menzerath-Altmann Law (MAL).[2] MAL is the specific form of the Zipf's law which is widely used in many scientific fields. For example the Zipf's law was used for describing the structure of junk DNA and prediction of its function.[3] In our research, we analysed proteomic sequences with regards to their secondary structures. The result of our analysis is that there is a strong dependency between protein size and average length of its secondary structures. We recognize that the longer the protein sequence is, the shorter its secondary structures are. We tested manifestation of the MAL on the randomly created proteins,[4] on the parts of the junk DNA and these do not exhibit MAL.

We will comment on our findings in relation with the concept of so-called meronomy: "Meaning is made by part-whole relations, and, therefore, semiotics is meronomy. There is no signification without functional differentiation".[5] In the case of the protein structure, we can say that secondary structures are the providers of the protein function (transport, building, signal function etc.). Thus we may consider function of the protein as a meaning and the sequence of the secondary structure as a text.[6] In texts of natural language but also in "biotexts"[7], whole (text) is not only a simple multitude of parts (signs), but there is a more complicated relation of interdependency and this can be explained by the emergence of meaning as "made by part-whole relations".

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[4] Ferrer-i-Cancho, Elvevåg 2010.
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"A Sign Is *What?*": A John Deely Memorial Symposium

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John Deely (April 26, 1942 – January 7, 2017) was a philosopher and a semiotician who made a massive impact on both general semiotics and biosemiotics through his expansion of the study of the fundamentals of signs and semiosis, and his positioning an analysis of the history of semiotics as the centrepoint for a complete re-orientation of the history of philosophy, as well as the direction of its future course.

Deely's training was that of a philosopher, thus he had not received formal training in the life sciences. However, he followed the trail set out by one of his closest colleagues and mentors, the polymath semiotician Thomas A. Sebeok (1920-2001), in developing an understanding of the nature of the sign relation that played a pivotal role in the erection of the theoretical edifice of biosemiotics.[1]

His insistence, following Peirce and Uexküll, on the expansive domain of semiosis across human and non-human biological worlds informed his rigorous and far-reaching sign theory, from which many of us in the biosemiotics community have learned much and have incorporated into our own understandings of the nature of signs in life.

Moreover, Deely was a staunch advocate of the project of biosemiotics, as well as a personal friend to many of us in the biosemiotics community. His ground-breaking and thought-inspiring works, his inspirational support of his semiotic colleagues and their semiotic institutions worldwide, and his ongoing investigation into the reality of sign process at every level of life present a full-blooded semiotic consciousness or "doctrine of signs" – a doctrine that has been and will remain a force that both inspires and that sets the standard by which our colleagues in biosemiotics continue with their important work.

In this session, a few of us who were close to John will attempt to honour his accomplishments in the way that he would have wanted us to most – i.e., by presenting, analysing, reconsidering, and arguing about some of his most important and original ideas regarding the action of signs in life. The session will be held symposium style and we are hoping that all attendees to the Gatherings will join in the discussion.

[1] Cobley *et al.* 2017

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Perception of Chaos: Challenge or Opportunity

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The idea of chaos is in itself ambiguous. While in the usual sense it is perceived as a meaningless irregularity, a harbinger of uncertainty and anxiety, on a scientific ground it is taken as the inevitable tendency of nature to degrade towards more probable configurations. However, chaotic systems need not necessarily be random. While randomness remains essentially unpredictable, chaotic systems may become deterministic, provided their initial conditions are known. In this presentation, we will discuss how knowledge of the chaos theory has affected our understanding of developmental systems far from the equilibrium, both in biology and psychology. The egg is neither uniformly nor disorderly organized, but in a condition definable as the edge of chaos, due to the embryo's need to maintain cell divisions synchronous. Chaos theory has also been applied to psychological practices with the aim of understanding how agentive subjects are forced to create new meanings whenever faced with a variety of anxiety-inducing situations. In this view, the psychological acceptance of chaos makes the agentive subject capable of releasing his future expectations from the restricted projections of past experience. All this implies that disorder is offered as a primordial condition for relationships to become potentially evolvable toward new levels of structural complexity. For this condition to be attained, however, the agentive subject is required to develop the capacity to perceive the order / disorder dichotomy as a perspective meaningful sign. In our view, Biosemiotics provides the right conceptual framework to allow agentive subjects to generate order out of the chaotic complexity of experience and to transform their hierarchically-rooted expectations into the creativity that stems directly from accessing wider contextual settings.

Syllepsis and Particularism in Biosemiotic Ethics

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The concept of syllepsis ("Both the exam and the chair were hard"), received from the German analytic and animal philosopher Hans-Johann Glock[1] as a possible understanding of non-conceptual animal cognition, states that the standard generalizability of terms such as "thought", "perceives", "sign", and "intention" in everyday parlance commits the error of misattribution when applied across different subjects. This is because named process or content do not remain static, but shift or modulate across subject types. Acknowledgement of syllepsis is little more than the commonsensical notion that the action of thought, or of signaling, is enacted differentially across diverse (classes of) subjects. Glock takes Wittgenstein's notion of "objectual deflationism" to distinguish between real things (beings, things, and signs) versus abstractions (like concepts and ideas that themselves do not move, catalyze and grow, like signs do) to make the case that "so-called abstract objects are not really *bona fide* objects at all".[2] Therefore, because they exist as cascading actions in the world, signs may be considered objects, whereas this does not obtain for hypostatic abstractions.[3] Distinguishing between those internal processes that conform with Uexküll's (1928) functional circle and invariably produce (at least theoretically) observable impacts, and abstractions that do not result in semiotic life, is a first step towards a biosemiotics of interiority (*Innenwelt*).

Recognizing the implications of syllepsis, that the methods and modes of meaning-making and the processes we relate to as sign-derived and sign-oriented, leads to a much more radical realization: that it is analytically useless to compare the apples of one species' mode of being in the world to the oranges of another. Admitting that different organisms have their own specific forms of intelligence, learning, and communicating, requires that these abstract concepts be adapted to the ways each organism engages these faculties. Furthermore, biosemiotic particularism, as outlined by J. Beever and M. Tønnesson[4], takes us deeper into splicing these generalizations into the diversity in ability access and expression in different organisms of the same species, and even the same organism, at different moments.

Employing two case studies, dolphins cooperating with artisanal fishermen,[5] and the multichannel simultaneous forms of plant communication,[6] this presentation makes the case that actions such as communication and learning differ in definition across species but that such descriptors properly understood as syllepsis may be no less apt. This both points to the limits of language to describe analogous phenomena, and also the staggering array of life's creative solutions to the functional issues that arise for living organisms evolving in diverse habitats.

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[1] Glock 2002; 2014.
[2] Glock 2002, p. 251.
[3] Stjernfelt 2007.
[4] Beever, Tønnesson 2016.
[5] Daura-Jorge *et al.* 2012.
[6] Gagliano *et al.* 2012.

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Umwelt <> Galaxies > Space

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This paper extends the presentation I gave at last year's Gatherings ("From Life to Architecture – to Life") to put forward the frame for a unified theory of space; that puts the biosemiotic project at the heart of spatial theory, and thereby defines biosemiotics a concrete bridge between biological theory and the humanities. Building on my presentation at the 2015 Gatherings, at which I argued "The Need for a Biosemiotic Definition of Space" my presentation will this year put forward the claim that if space is other than the void, it is a matter imbued with meaning. Consequently, space is a fundamental concept of life. Given space has been a matter of contention since antiquity, it seems a proper definition is required; and given biosemiotics is the study of communication and signification in and between living things, it seems that biosemiotics may be well placed to provide some closure to this historic debate.

Following Uexküll's (1926) conception of space, established on the basis of signs perceived by an organism as a consequence of its sensorial constitution form the organism's umwelt, I propose the architect (and proto-biosemiotician) Frederick Kiesler's Correalist theory (1939) to provide the keystones to a unified theory of space. Kiesler was ostensibly influenced by Uexküll, and I will show that Umwelt theory was a fundamental aspect of Kiesler's particular conception of space. Reading Kiesler's work in this light has implications for biosemiotics. My intention here is to present the basis for a fundamental explanation of space – one that provides a unified conception, based in biology, that defines a biosemiotics definition that transcends disciplines.

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Social Cognition of Captive Chimpanzees in a Biosemiotic Perspective

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There are two crucial problems concerning cognitive research on the social behavior of animals. (1) How do animals relate to their conspecifics? (2) Which methodology should a researcher use to gain this knowledge? There are several disciplines where these questions have a prominent position: cognitive ethology,[1] comparative psychology,[2] and philosophical ethology.[3] However, there has been minimal productive contact between different paradigms in this matter. Recently, biosemiotics and human-animal studies have become fields where fruitful cross-fertilization of different approaches takes place.

The primary aim of the presentation is to bring a new theoretical perspective to the research of the social cognition of animals. To carry out this aim, we will mainly build on the Tartu School of Biosemiotics and multi-constructivist approaches to ethological studies.[4] Whereas Tartu biosemiotics has brought a semiotic understanding to the double-fold problematics of ethological enquiry, a tri-constructivist methodology brings an additional layer: (3) How do the ontological commitments of a researcher frame the dispositions of the observed animal?[5]

In a theoretical perspective of the Tartu School, animal behavior needs to be studied in three different contexts: (1) species-specific Umwelt, (2) individual history of particular animals, (3) relations of the animals to their environment (both social and physical).[6] If all these three contexts are taken into account, the animal mind can no longer be modeled as a distinct entity isolated from individual bodies living in concrete environmental settings.

Our case study aims to deconstruct Shared Intentionality Hypothesis developed by a leading school of comparative psychology at the Max-Planck-Institute, Leipzig.[7] It will be argued that the hypothesis does not identify a cognitive difference between the chimpanzee and man, but results from misunderstandings of the Umwelt of laboratory chimpanzees and their social needs. In order to understand social cognition of captive chimpanzees, we need to evaluate multilevel interactions between individual animals – keepers and researchers – environmental settings.

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[1] Waal 2016; Bekoff *et al.* 2002; Allen, Bekoff 1999.
[2] Call, Tomasello 2008; Penn, Povinelli 2007; Leavens 2011.
[3] Lestel 2011; Lehto 2009.
[4] Maran *et al*. 2011; Mäekivi, Maran 2016; Lestel *et al.* 2014.
[5] Jaroš 2016.
[6] Uexküll 1928; Sebeok 2001; Maran 2010; 2014.
[7] Tomasello 2014.

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Blinded by Blending: Natural and Artificial Signs of Social Impressions

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Portrait photograph blending is an old procedure, first used by Francis Galton who applied it to reveal features typical of certain categories of people. Long after Galton, average composites are still used, though they have been technically improved. Many researchers use manipulated composite stimuli to investigate various causative effects of facial traits on social impressions. I consider this research agenda as at least problematic.[1] Unlike individual images, composites yield clear results even when the sample size is low. For instance, Gillian Rhodes[2] reports a strong positive relationship between symmetry and attractiveness in composite faces, but only moderate effects in non-manipulated faces. And similarly, our cross-cultural research shows only moderate or no relationship between attractiveness ratings based on unmanipulated facial photos (and short videos) and averageness computed as each face's distance from sample Procrustes mean. The use of experimentally manipulated stimuli thus has various practical consequences, such as greater effect sizes and a higher probability of positive results. So why do composites yield stronger effects?

It may have something to do with the signalling theory in biology.[3] Signals are supposed to manipulate the behaviour of receivers and while signals often involve several modalities, thus acquiring a rather high complexity, the semiotic freedom of their interpretation is limited. Elsewhere,[4] I suggest that exposed surfaces of organisms, including human faces, represent semiautonomous relational entities called semantic organs (SO). A signal is actually a semantic organ with a significantly reduced variation: the less variation there is, the more effective the signal. By manipulating facial stimuli, we constrain the variation of the SO, thus in effect constructing artificial signals.

Moreover, stimuli experimentally manipulated for a particular research purpose become a reification of our theoretical needs. This is a problem when such stimuli are not used as research tools but substituted for natural objects (faces), that is, when individual faces with their natural variations are substituted for manipulated stimuli whose variation is constrained in a way that *a priori* corresponds to expectations given by a theory. By constraining the variation of stimuli, we also limit the variation of possible responses to these stimuli. One might claim that this is how experimental science works, which may well be so, but properties of the experimental toolkit must be included in the interpretation of the results. This is commonly done in some fields of experimental physics, but often neglected in evolutionary psychology and biology.

What are the alternatives? First, to use unmanipulated stimuli. Second, to use stimuli manipulated so as to correspond to the observed range of natural variation. Third, to use both manipulated and unmanipulated stimuli; the difference in results could then be used as a background to the overall interpretation of results. Experimentation which uses manipulation sheds light on the ambiguity of our reality, but this light can be so sharp it blinds us. Unmanipulated stimuli, on the other hand, often do not let us see the light through the canopy

[1] Cf. also Schaefer *et al.* 2009.
[2] Rhodes 2006.
[3] Maynard Smith, Harper 2003.
[4] Kleisner 2015.

of high variation. Perhaps, to see the fine reflections of social reality, we should learn to walk in shade with our eyes wide open.

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Physical World and Semiosphere: Rethinking the Epistemic Cut

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This paper focuses on the requirement for diversifying sciences, their methodologies and predictive processes.[1] Given this fact, there arises the epistemic need for tracing not only features of particular principles but also the characteristics of codes. These codes are used in relation to the agent, which *inter alia* allows the creation of physical and semiotic categories. Such categories are not rigid, and their functions should not consist only in the ability to categorize. They should be described as complexly connected relations which reflect: (1) the potential of descriptivity given by incommensurable theories (e.g. physical / chemical and semiotic) and (2) the used code itself. The logical and physical requirement of such a description is a conceptual separation called the epistemic cut.[2] This concept is being again discussed against the backdrop of its potential and analogies in semiotic and physical descriptions.

These are the steps of our investigation: (1) At first, we deal with historical references to the concept of the epistemic cut. (2) We describe the need for considering the epistemic cut in the light of the classical and quantum theory of physics. These references are also important later when creating a metaphor proposed while rethinking the key concept. (3) We illustrate a need for a paradigm extension of biology given by differences in teleological and mechanical principles. Additionally, the issue of the theoretical background needs to be explained in order to introduce the perspective of authors. (4) We reflect the boundaries between the physical and semiotic systems and take into account necessary concepts of the agent and Umwelt. Describing various dualities of code[3] seems to be a logical and necessary part of our interpretation. Based on the various theoretical backgrounds we thus describe dual conceptual oppositions and search for their similarities.

These are our goals: (1) illustration of appropriateness of paradigmatic extension (mentioned above) – it is given by epistemological purposes and built on a basis of analogy concerning incommensurable theories, physical and semiotic descriptions and types of codes. (2) While rethinking the epistemic cut, we try to come full circle by returning to the point of comparing classical and quantum theories in physics. (3) Concerning the typical agent, we propose the quantum decoherence[4] as the extension of the epistemic cut. (4) Finally, our description is illustrated by a metaphor concerning the whole interpretation in its overall potential.

[1] Among others in e.g. Kull 2005.
[2] In e.g. Pattee 2001; 2012.
[3] Hoffmeyer 2000; Barbieri 2015.
[4] Zurek 1991.

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On the Structure of Biosemiotic Theory: Are there any Rules in Organic Meaning-Making?

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There exist law-like generalizations in linguistics, economics and sociology; thus it seems relevant to ask about analogical generalizations in semiotics and particularly in biosemiotics. An important assumption we should take into account while approaching semiotic invariances is that universals in *Σ*-sciences are ontologically different from generalizations in *Φ*-sciences (R. Vihalemm's term), because the objects of *Σ*-sciences are themselves of the type of knowledge-making or of the knowledge-product, i.e. of meaning-making or artefact. Using several examples of biological generalizations (Müller's law, Fechner-Rosa's law, Minot's law, Eichler's rule, Fox's rule, McShea and Brandon's law), we shall analyse whether some of these can be seen as biosemiotic "laws", comparing the former with the general principles formulated by Thomas Sebeok and Jesper Hoffmeyer.[1] We shall interpret these in the light of Bateson and Laland's (2013) update to Tinbergen's (1963) "four questions".

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Associative Semiosis and Epigenetic Inheritance of a Neural Code: Theoretical and Biosemiotic Problems

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One of the key questions of biosemiotics concerns the evolution of distinct types of intentional processes in nature and their roles in mediating non-genetic, "soft" modes of inheritance. Here, we propose that an important aspect of this problem can be approached in the light of recent studies in neuroepigenetics, as well as its theory and history in the field of evolutionary physiology of associative learning. Recently, these two areas have begun to converge, with first direct evidence now indicating the possibility of transgenerational epigenetic inheritance of conditional associations in the mammalian nervous system.[1] This may serve as an interesting example of semiotic code-making, where the molecular mechanisms underlying arbitrary associations between stimuli are found to involve lasting changes in gene expression that may be transmitted epigenetically across generations,[2] and which, given recent findings and analyses, may become further stabilized and assimilated into the genome over subsequent evolution.[3] Here, we show how this would offer an interesting and so far overlooked confirmation of earlier research carried out in the field of evolutionary physiology, primarily by one of I. P. Pavlov's leading students, P. K. Anokhin, and his colleagues,[4] but also eminent physiologists of the time, several of whom offered arguments for the possibility of inborn reflexes representing evolutionarily later, specialized and reduced forms of conditional reflexes, from which they may be derived (A. A. Ukhtomsky, D. A. Biryukov, A. B. Kogan, etc.), with interesting, seemingly intermediate cases between the two found in nature.[5] Although discarded in the wake of the increasing influence of modern synthesis,[6] these results may currently deserve renewed attention given the re-emergence of physiology and neo-Lamarckian modes of inheritance to the centre stage of evolutionary biology,[7] and directly compatible empirical findings. While admittedly provisional, these open new questions on the role of associative learning as a possible driving factor of metazoan evolution,[8] similarly as this has been shown for microorganisms,[9] and may be relevant even for plants.[10] Furthermore, the above materials may be interesting for a theoretical analysis comparing biosemiotic and code-biological interpretations of evolutionary novelties – particularly regarding how contingent, associative, and interpretive rules may become historically established to form stable, if not irreversibly assimilated, neural codes, as one subtype of organic codes.[11]

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[1] Dias, Ressler 2014; Szyf 2014.
[2] *Ibid.*
[3] Noble *et al*. 2014.
[4] Anokhin 1974.
[5] *Ibid.*, pp. 17-24.
[6] Cf. Suvorov *et al.* 1991.
[7] Noble *et al.* 2014.
[8] Ginsburg, Jablonka 2010.
[9] Mitchell, Romano *et al.* 2009.
[10] Gagliano, Vyazovskiy *et al.* 2016.
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Lev Vygotsky's Natural History of Sign Operations

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Lev Vygotsky's research is somewhat known, at least in its most general outline, in semiotics for its understanding of children's development as fundamentally a sociocultural process. His work has sometimes been adopted in the semiotic research through his concept of sign as a psychological tool, which he introduced independently of other major theories of signs. Previously, it has been argued that concepts of signs as tools are not compatible with Peirce's doctrine of signs. Yet, Vygotsky's concept of symbolic activity is broader than his concept of sign, while lacking some of the downside which instrumental concepts might bring along. Furthermore, in his later works, Vygotsky himself abandons, to some extent, the instrumental concept of sign, and adopts Husserl's terminology. In this presentation, it is argued that the concept of symbolic activity is fully acceptable in the conjunction of both bio- and cultural semiotics, as it brings together, on the symbolic threshold, cultural and cognitive development of the child both on the processual level, and in ontogeny. While arguing that the development in symbol use in children is a qualitatively independent line of development from the organic development, Vygotsky's work remains essential in rooting the cultural semiotics in the individual, and in explaining how children become full participants within their cultures. In the context of anthroposemiotics, these separate, but dynamically interwoven lines of development might shed new light on the dynamically changing relationships in the humans' lives, humans being considered both cultural and biological beings.

The Self and the Other of Introduced Trees in Urban Environment: A Synthesis of Organismic and Sociocultural Perspectives

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The ability to respond to novel cues or to find familiar ones appears to be crucial for the survival of introduced species. Yet, what is categorised as "familiar" and "own" by the species itself and by the introducing society, might vary to a significant extent. In cultural terms, an introduction of a species actualises or confirms the conceptual borders, which separate and relate the "self" and the "other". It is a tool for bringing the "other" into one's own domain, either as an exotic or as a domesticated and functional unit. The biological activity of the organism – reproduction, diseases, (in-)ability to adapt – will question and transform the initially laid borders. The umwelt of a species (*sensu* Jakob von Uexküll) will hence be introduced to the sociocultural system as a new element of meaning production.

We will analyse the human-plant co-creation of the borders between the self and other, using the Estonian town Tartu and its foreign tree species as an example. Building on this example, we aim to demonstrate the ecosemiotic and ecopolitical mechanisms behind the accommodation and reconciliation of the introduced species and the local cultural and natural environment. In addition, we will observe how the dissemination and recreation of communities has taken place by concentrating a naturally dispersed set of species in a small urban area. The analysis of those processes helps to reveal how the borders between self and other in urban space are constructed or dissolved through the selection of species for this environment.

Addressing Material Processes in the Framework of Biosemiotic Ontology

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My attempt with this presentation is to bring biosemiotics closer to the earth by arguing its potential relevance for addressing the ecological problems of our time. By focusing on environmental problems, biosemiotics should develop tools and methods for accessing material artefacts and processes that are important counterparts of ecological problems. This understanding has been tackled so far because of the proliferation of the cognition-based approaches in biosemiotics and of the disagreements between biosemiotics / pansemiotics schools. At the same time, there is a number of conceptual approaches in ecosemiotics that would allow addressing material processes in ways that would not violate the ontological presumptions of biosemiotics. For instance: 1) *Resource criterion* analyses resources as being materially based, related to an organism's functions and needs, and mediated semiotically;[1] 2) *Ecological codes* emphasise distributed and environment-bound nature of interspecies communication;[2] 3) *Semiotic pollution* describes breakdown of sign systems and sign mediation due to internal or external disturbance.[3] In my presentation I will discuss, with the help of specific examples (e.g. mimicry, tool usage), the perceiving ecological processes as simultaneously semiosic and non-semiosic, that is, as bonding semiosis with the flows of matter and energy. The presentation will make some preliminary suggestions about semiotic modelling tools suitable for analysing dynamics between semiosis and material processes.

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How Much of the Human Genome is Functional?

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In his 2002 article "The Chicken and the Orphean Egg: On the Function of Meaning and the Meaning of Function", Claus Emmeche mentions two crucial characteristics of living systems that make them radically different and irreducible to physics and chemistry: (1) biosystems (organisms) contain genetic information; (2) biosystems (organisms) have functions. The "genetic information" of point (1) could, from a naïve viewpoint, be equated with the genome of the organism, but that would ignore point (2). Not all DNA of an organism is necessarily functional, and therefore, not all DNA necessarily carries information in any non-trivial sense of the word.

The human genome comprises roughly 3,1 billion base pairs of DNA, but only slightly more than 20,000 protein-coding genes (estimates vary a bit). This means that only around 1% of the DNA is directly protein-coding. What is the rest doing? If we take into account known RNA-coding genes and regulatory regions, we end up with only 2-3% of the DNA having a function we can account for. The rest may have functions we don't know yet, or it may be "junk" – DNA that is just there without actually doing anything good for us.

So how much of the human genome is functional? The answer depends on what you mean by "function" in biology. Using a "selected effect" concept of function, various groups have estimated the fraction to be 5-15%. However, using a "causal role" concept of function, the ENCODE consortium in 2012 reported that they had found function for 80% of the genome, prompting science writers to talk about the "eulogy for junk DNA". Of course, this sparked a heated debate.

From a biosemiotic perspective, both the "selected effect" and the "causal role" definitions seem to miss the point. The "selected effect" definition is diachronic, making it impossible to talk about function without taking history into account and thereby turning a concept such as "a new function" into a contradiction in terms. The "causal role" definition is synchronic, but completely misses the crucial characteristics of living systems. According to Emmeche, however, "[a]ny biofunction is something (a process or a structure) that has meaning for the organism as an interpretant system".

I will argue that Emmeche's biosemiotic concept of function, when applied to the genome, is intricately linked to Bateson's definition of information as "a difference that makes a difference", and that this will result in an estimate of functional DNA that is closer to the "selected effect" than to the "causal role" estimate. In other words, the rumours of the death of "junk DNA" are exaggerated.

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Time as Linguistic System: E-series Time for Bio-Synchronicity

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The aim of our paper is to explain that: (1) time is a linguistic system, and (2) living organisms adopt a time code called E-series time.[1] Illustrations are drawn from: (a) cellular circadian clocks in duckweeds, (b) Kai protein oscillators of cyanobacteria, and (c) "chemical affordance" internally observed in the citric acid cycle.[2]

A living organism sways the time of its own world; that is, without living organisms there can be no time.[3] The physical time with use of a clock seems only one kind of time. Biological time is not clock's time applied to the world of physics.

What makes the Uexküllian argument valid? Time is always based on some kind of punctuation, which functions as a boundary maker.[4] Otherwise, the passing of time would not be grasped in relation to one's space. Or, any kind of clock can be said to consist of closed loops of signifier and signified, which is indexical pointing of the other and being pointed by the other.

The time classifications by McTaggart (1927) are here adopted as linguistic categories, turning the inquiry from ontology to epistemology. Time is not considered a single physical entity but plural semiotic expressions each having their own style of punctuation. Time having tense (the past, present and future) is the A-series; time without tense but having earlier-later relations is the B-series; time having neither tense nor earlier-later relations is the C-series.

Nevertheless, the biological mode of time making via interaction and synchronization mediated by the action of signs does not fall into the above categories. We propose E-series time to cover a mode of punctuation that is negotiated interactively with use of a functional loop of sign activities.

In the language of semiotics, each sign vehicle receives a sign from the vehicle situated in the immediate upstream (one preceding), interprets the received sign and then sends off a transformed sign to another vehicle in the immediate downstream (one succeeding). The consequential clock consisting of the loop of the sequence of the

[1] Nomura, Matsuno 2016.
[2] Gibson 1979; Matsuno 2013.
[3] Uexküll, Kriszat 1934, p. 13.
[4] Baetson 1972.

transformed signs comes to implement the time making in the E-series.

In the language of communication, on the other hand, two or more agencies are locally synchronized as "the second-person negotiator". Like two dancers getting in step with each other, biological formations or metabolisms are also in step with their surrounding environment, continuously adjusting the timing of punctuation through mutual indexical exchanges. Such local time making is in the E-series.

Synchronicity at a close look shows incessant mutual adjustments of trial-and-error, which is comparable to Learning I, while the formation of a functional loop – a step higher in logical type – then corresponds to Learning II, where minute differences are sensed and extinguished by negative feedback to stay in parameter.[5]

We then discuss: (1) retrocausality (backward causation) of the running of feedback loop in relation to the biological identity, and (2) chemical affordance permitting the environment to act as an agency.

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[5] *Ibid.*

Learning as Adaptation

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I argue that, from a biosemiotic perspective, the concepts of adaptation and learning are seen as one phenomenon. Biosemiotics implies a view of learning, in a cultural sense, as continuous with adaptation. It has been typical of dualist modern philosophy to understand adaptation as a crudely biological process, applying only to non-human animals, while construing learning as a strictly human specific process. Biosemiotics challenges this adaptation / learning dichotomy by seeing both of these as belonging to the same continuum of semiosis. Both learning and adaptation are cases of interpretation, phenomena by which organisms shape their Umwelten. In this perspective, learning in the cultural and educational sense is a stage on the evolution of semiosis and a particular embodiment of adaptation. Our understanding of learning is intimately linked to the way in which we relate to our environment. Since learning is a semiotic competence which organisms acquired as evolution itself adapted to recognize structures of signification, the environment which we populate simultaneously makes learning possible and imposes thresholds to our learning. The modern belief that, through its learning capabilities, humankind can control nature is deeply damaging for our environment. The ecological crisis is the proof that our mental life is not detached from the life of the environment. Construing human specific ways of learning, such as scientific inquiry, as transcending biological evolution, justifies humankind's exploitation of natural resources to the detriment of other species and, consequently, to its own. From a semiotic perspective, learning is a matter of adaptation to structures of signification. In the biosemiotic view that semiosis proceeds on multiple time scales, our current cultural learning is understood as an Interpretant of natural evolution. This holistic understanding of learning and adaptation endorses an implicitly ecological philosophy of education. I conclude by explaining the implications for education and ecology that this semiotic account of learning brings.

The Implications and Relations of Biosemiotics to Phenomenology and Humanities

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20th century phenomenology contributes to emphasize the limits of mechanistic biology for the analysis of living systems and their behaviour. The philosopher Merleau-Ponty (1908-1961) – one of the most important representatives of this trend in phenomenology – attempts to a very critical rethinking of the total separation between nature and culture and even more between the life sciences and humanities, which the Galilean science and the modern philosophy contributed to separate so much.

This proposal stresses the close relationship between Merleau-Ponty and the modern biosemiotics, whose attempt is to apply semiotics into the interpretation of the events of nature.[1]

As the biosemiotics claims, we cannot omit from considering that organisms are embedded within the environment, with respect to which their actions should be "concordant or discordant with the dynamics of achieving the end".[2] From this point of view, biosemiotics highlights the central role of the interpretant "in the process of semiosis as it can lead to a change in the disposition of the organism for different behaviour".[3] Accordingly, as Kull emphasizes, "biosemiotics means the study of living systems that interprets them as sign systems, or communicative structures".[4]

The term *interpretation* reminds us of what Merleau-Ponty writes about the differences between organisms and machines: "definition [of a machine] is independent of content; it must not transform";[5] "[t]he machine functions, the animal lives – that is, it restructures its world and its body".[6] Merleau-Ponty's reconceptualization of nature has been highly influenced by Jakob von Uexküll's theory of meaning, according to which meaning is the key concept of life.[7] Merleau-Ponty's foremost argument in the course *Notes on Nature* at the Collège de France (1956-1960) is the need of understanding the umwelt as an open field of relational exchanges, where organisms swap around meaningful signs and gestures. In *The Structure of Behavior* (1942), he also emphasises that animal behavior reveals a certain different norm of biological organization, which plainly opposes the specificity and individuality of living beings to the generality and interchangeability of physical entities, which are anhistorical.

Merleau-Ponty's rejection of mechanical determinism in biology is based on the assumption that explanatory models of living systems aim at providing the invariance with respect to all possible transformations of dynamic processes. Nevertheless, biological phenomena are hardly reducible to generality of physical laws, because specificity lies at the core of evolvability.[8]

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[1] Jämsä 2007.
[2] Kull *et al*. 2009, p. 171.
[3] Barbieri 2007, p. 461.
[4] Kull *et al*. 2009, p. 175.
[5] Merleau-Ponty 2003, p. 159.
[6] *Ibid.*, p. 162.
[7] Jämsä 2007.
[8] Pattee 1996; 2001; Longo, Montévil 2014; Longo, Pagni 2015.

Let us consider that both Merleau-Ponty and biosemiotics strengthen the issue of "historicity" of living systems, also emphasizing that the ability of a system for adaptive evolution is conveyed by achieving a meaningful mutual exchange between organisms and their environment. In particular, biosemiotics suggests that organisms inherit the access key to such meaningful relations through codes and organic memories selected by evolution. From this point of view, the aim of biosemiotics to reintroduce the semiosis in the events of nature meets up with Merleau-Ponty's reflection on nature, which stems from the attempt to account for biological life as the result of the embodiment of meaning within the history of natural evolution.[9]

In Merleau-Ponty's view, the instance of phenomenology is to present a new experience of the lived body as 1) a phenomenon of nature and 2) a phenomenon of culture, e.g. capable of processes of signification. As I argue,[10] evolution results from the activity of selected constraints that aim at enabling the inheritance of adaptive and meaningful semiotics exchanges at all levels of biological organization.

Finally, through the "semiotization" of life I glimpse one possibility (of course not the only one) to bridge the gap between nature and culture – i.e. between the causality of science and the interpreting attitudes of humanities[11] – which also can open out to a new epistemology of the living.

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[9] Harney 2007.
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Animals and the Empirico-Transcendental Doublet

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The empirico-transcendental doublet is a concept used by Michel Foucault to name a particular, historically specific understanding of what "man" – the human being, or human nature – is. This "figure", as he calls it, is one which, according to Foucault, ushered in modernity and laid the foundation for the human sciences, and is described as "a being such that knowledge will be attained in him of what renders all knowledge possible",[1] a "paradoxical figure in which the empirical contents of knowledge necessarily release, of themselves, the conditions that have made them possible".[2]

Thus by definition this figure, which is central to the genesis and genealogy of the humanities, of the human sciences, is inward-turning and exclusionary, which goes a long way in explaining why it took such a long time for something like the animal turn (and even later, the turn to things, to objects) to appear as a discipline or a programme of research within the humanities. For the logic of the doublet necessarily also impacts that which may at first seem to fall outside its purview: in the logic of the doublet, animals are left over as a spectral remainder: cast out as leftovers, yet brought back as a reminiscence of the animal within. Animals are included in general discourse only in order to signify their own expulsion, as if placed on the outside of the inside, or vice versa. They find themselves within the machinery of exclusion-inclusion, as the always-present rejects of what Giorgio Agamben described as foundational to Western politics and metaphysics: "man is the living being who, in language, separates and opposes himself to his own bare life and, at the same time, maintains himself in relation to that bare life in an inclusive exclusion".[3]

As long as the logic of the doublet is operable within the human sciences, knowledge of animals is neither objective nor subjective, but abjective. They are neither the beings who have been put in front (as the etymology of *objectāre* says) of human discourse, ready to be brought in as objects of knowledge (as in the empirical sciences), nor made subject to the symbolic flourishing of the imagination for which the empirical is mostly irrelevant (as in medieval bestiaries and in the arts). Instead, they are abjects, the out-casts, the thrown-downs.

If, as Foucault once exhorted us to do, we should reply with a silent philosophical laughter to all those who wish to "refer all knowledge back to the truths of man himself, who refuse to think without immediately thinking that it is man who is thinking",[4] this presentation will make an attempt at something like a reversal: what if the philosophical animals themselves look at humans and assess their thinking, instead? With leaf insects, vampire squids, moles, and others, it will present at its conclusion a somewhat irreverent return of the animals, from their incommensurable umwelts, to think and laugh at us instead.

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[1] Foucault 1966 [2002, p. 347].
[2] *Ibid.*, p. 351.
[3] Agamben 1998, p. 8.
[4] Foucault 1966 [2002, p. 373].

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Dialogue between Code Biology and Biosemiotics

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Following Codexit, Code Biology (CB) has separated from Biosemiotics (BS) in 2013. In the aftermath, I still envision a meaningful dialogue between CB and BS. Codes play an important role in life because they represent lower-level signaling and regulation in organisms, especially at the molecular level. Life has started from primordial molecular codes; and thus, if BS claims that life and semiosis are coextensive, then codes should be recognized as a special primitive case of semiosis, or *protosemiosis*. In my talk I explore the principles of a dialogue between CB with BS and clarify the terminology that may facilitate such dialogue. Peirce's triadic sign relation is not relevant for protosemiosis, and thus we need to accept a broader notion of sign, as a tool used by goal-directed agents to initiate or regulate their own actions or actions of other agents. Marcello Barbieri's theory of organic codes follows the tradition of structural linguistics, where language or communication is described as a formal system with internal relationships. Such system is viewed as a stand-alone object without considering agents, who may use it or not. This structural methodology should be complemented by a *dynamic approach* where signs and their meanings emerge and change at the evolutionary and / or ontogenetic time scales. Code as a mapping of signs to their immediate meanings is not sufficient to explain these changes; it should be combined by information about the remote meanings that participate in the autopoietic closure of reproducing organisms or agents at other levels (e.g., molecular complexes, cell organelles, colonies, and consortia). For example, rules of the genetic code do not explain the pathways of genome evolution, which include the emergence of DNA methylation, binding of transcription factors, chromatin modifications, as additional sign relations. Thus, codes are static snapshots of the continuous evolution of signs and their meanings. Studying the evolution of codes requires a theory of agency which is being developed in BS. In this sense, BS has a broader scope than CB. Attempts to exclude molecular mechanisms of information processing in cells from *semiosis* disrupts the integration of BS with CB. In particular, *semiosis* should not be confused with *semiopoiesis* (i.e., creation of new sign relations), which is studied in BS but not in CB.

The Epistemological Stakes of the Biosemiotic Approach

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Biosemiotics is now the only structured discipline that explicitly and reasonably defends the specificity of life phenomenon. In this sense it is the heir of vitalism. However, since its defeat at the beginning of the twentieth century, vitalism has become a shameful legacy, which has led to biologists being diverted from what should be their primary objective, the definition of life.

Alas, as soon as the most orthodox members of the scientific institution feel that a new theory risks calling into question their paradigm, they stigmatize the text by evoking rather blurring concepts such as of mysticism, metaphysics or vitalism and by this way, excommunicate the potential dissidents.

To get out of this kind of criticism, it seems to me necessary:

First to analyse and highlight what lies behind this "blur". If, by vitalism, we mean "defense *of the specificity of the behavior of living systems*", any discourse that preaches this specificity will be described as vitalistic, even though this specificity is *obvious* to the layman. If by mysticism or metaphysics we mean "*a reference to a reality that transcends that of the physical matter*" any non-reductionist theory will be called "mystical" or "metaphysical" even though these two terms concern the *deepest values* of our human experience. Life is not the property of anybody. It does not have to submit to the epistemological principles of a science originally elaborated for the study of the so-called inanimate matter. In a second phase, we have to work on the development of a theory of life. To do this, it is conventional and quite appropriate to base on the prokaryotic cell, the simplest living natural system we know. Today, although we have dismantled and analyzed all its biomolecular parts and mechanisms, fundamental biology confesses its inability to understand the emergence of a finalized behavior from a set of biomolecules assumed to be subjected to the causal and deterministic laws of physico-chemistry.

I propose here first to demonstrate that the strict application of mechanistic-reductionist-causalist principles to this elementary cell inevitably lead to unacceptable epistemological ambiguities and paradoxes.

I shall then show that, by means of an in-depth revision of the classical framework of science and a questioning of the second principle of thermodynamics, it is possible to remove these ambiguities and to resolve these paradoxes. The price to be paid for this radical revision is a change in the obvious model, that is to say, of the paradigm underlying every general theory. Here, the machine will be replaced by our own organism, that is, the mechanicist paradigm will be replaced by an organismic one.

Project Cicero: Semantic Pareidolia Introduced

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Pareidolia is a psychological phenomenon that causes some people to see or hear a vague or random image or sound as something significant. Common examples are perceived images of animals, faces, or objects in cloud formations and object configurations. People differ in the propensity to recognize those meaningful patterns, the tendency to interpret two dots and a line segment as a face is almost universal. Evolutionary explanations for this kind of visual pareidolia rest either on the assumption of specialized cognitive module for face recognition which is triggered very easily or general error management theory – perceiving stimulus relevant for survival (possible predator or enemy) when there is none can be far costlier than missing such stimulus when it is present.

We would like to expand the term pareidolia beyond its usual visual or acoustic domain and present it as a result of fundamental human tendency to search for a meaning (with face as a semantic organ being preferentially perceived in some occasions).

"Project Cicero" is a piece of generative art. It creates random utterances of "wisdom" and posts them online. The built-in algorithm takes several words of Lorem-ipsum – filler text used in printing and typesetting industry – and translates them to the Czech language with web translator creating a sequence of (sometimes) existing words. Lorem-ipsum should not drag any attention with meaning, it is scrambled, improper Latin. People are, however, able to interpret the translated version and gain some fun with it. People rate Project Cicero's quotes and post them on social networks.

We took 1500 most popular quotes generated by Project Cicero in 2015 and administered them to Czech-speaking participants via on-line questionnaire on Qualtrics platform. Each participant (N=763) was presented with 100 randomly selected quotes and asked to classify them as Dada poem, Practical advice, Truth or Quote from *The Hitchhiker's Guide to the Galaxy*. Together we obtained 41 228 individual classifications, Dada being by far the most frequent.

We identified Dada with the Absence of meaning attribution, since Dadaism is commonly associated with randomness and nonsense. We grouped the other three options under a label of Meaning attribution – manifestation of semantic pareidolia. None of the 1500 quotes were unambiguously classified as any of above-mentioned categories (not even Dada) by all raters. This showed us that the meaning is "in the eye of beholder".

Participants who evaluated 95 or more quotes were included (N=368) in subsequent analysis. There were enormous between-individual differences in propensity to semantic pareidolia (number of quotes evaluated as Dada ranged from 0 to 99 with mean 56.4 and SD 27.0). Women (54.3±26.1 Dada quotes per individual) were more prone to semantic pareidolia than men (62.3±28.4 Dada quotes per individual), which is in accordance with previous findings of studies focusing of visual pareidolia.[1] This difference was significant

[1] Proverbio, Galli 2016.

($F_{(1,366)}$=6.389, p=0.01), however the effect size was rather small (Cohen's d = 0.30) due to huge overall variance. Age was not a significant predictor of semantic pareidolia ($F_{(1,366)}$=0.215, p=0.64).

Our results suggest that pareidolia is more universal than previously thought and can be linked to such topics as language evolution. Consensual "rigid" sign systems can generally descend from more interpretative "pareidolic" communication. The fact that teenage girls lead language evolution[2] might stem from their lust for meaning.

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[2] Nevalainen, Raumolin-Brunberg 2016.

An Attempt at a Zoosemiotic Approach to Ethological Parasitology

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1. Parasitism is the most diverse and widespread form of symbiosis. The main, and, shall we say, universal, difference between parasitism and predation lies in that parasites are biologically and inevitably interested in keeping their hosts alive, whereas the predator has to kill (or the act must have happened as a result of other factors) its pray. The latter must die for the predator to feed, while no parasite can feed off and develop in a dead host. Consequently, most parasite-host relationships are evolutionarily developing toward tolerance. However, this development is subject to many biological difficulties. It is not at all easy to keep the host alive, and we know many examples of highly pathogenic interactions, especially in cases of evolutionarily new relationships, for example between the Ebola virus and humans. I suggest that the underlying approach to the formation and development of parasite-host relationships lies in the field of zoosemiotics.

2. Aristotle noted that various effects inevitably affect those who are predisposed to suffer them. Parasitologically speaking, we can rephrase this: in order to become a successful parasite, one must find a predisposed host. For a parasite, its host is fundamentally a goose that lays golden eggs. To kill that kind of goose would be biologically most unsustainable. However, in animal associations in ecosystems, there is always the very real probability that someone will kill your goose before it can lay its eggs. Therefore, it is most favorable for a parasite to have control over this generally unfortunate event by making sure whatever kills its goose becomes its successor. This is probably the main evolutionary trend in the development of the complex life cycles of parasites. I presume that the most effective way to complete this cycle successfully is to influence the behavior of the host to the effect of boosting the probability of the latter meeting its end by proxy of a suitable predator. For example, larvae (metacercariae) of certain fluke worms of the genus *Diplostomum* affect the vision of infected fish in a way to make the latter rise just under the water surface in broad daylight and become significantly lighter in color, which renders it a decisively easy pray for any fish-eating birds above.

3. Evolution of host species' defenses against parasites is obviously one of the most interesting and, I suppose, promising fields of research in terms of sexual selection. There is a convincingly established hypothesis that the very phenomenon of sex and herewith gonochorism is an evolutionary response to parasitism. Because testosterone and corticosteroid hormones are strong antagonists, choice of sexual partners leans toward specimens sporting well-balanced genotypes that offer a high probability of offspring with high levels of tolerance against parasites. It is well known that hormonal defenses are much higher in females than in males. Also, because the energy cost of the bio-synthesis of an egg is considerably higher than it is in case of sperm, the final choice of partner is universally made by females and is based heavily on semiotics.

4. All animals, males in particular, look for new objects and phenomena in their ecosystems that leave a strong impression. The latter first and foremost manifest as significant hints to a force, effect, attribute – bright colors, strong scents, unusual sounds. This interest and general need for new impressions is connected via comfort and sexual behavior to host species' search for defenses against parasites. This occurs on a broad scale, and I believe it correlates well with females' relatively heavier load of parasites and greater parasitological diversity in males.

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