

A text on biosemiotic themes

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What follows is a two-part review of Günther Witzany's two-part book, *The Logos of the Bios* (2006, 2007³). The first part of the review is written by Sergey Chebanov, and it approaches the text as a source of ideas on biosemiotics and biohermeneutics. The second part is written by Anton Markoš, and it estimates the biological pithiness of the book and the correctness of the reflection of the included data of modern biology.

On biocommunications and biocommunion

If new directions of thinking are marked by the occurrence of separate articles and their collections, a sign of the transformation of such directions into a high-grade discipline is the publication of books. I have already written about the appearance of the first monograph on biosemiotics (Chebanov 1998). For the last decade, the publication of monographs on biosemiotics was a very rare event. The work reviewed here is even more uncommon.

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³ Hereinafter referred to as *LB1* and *LB2*.

As well as the previous book by the author (*LB1*), this is not a monograph in a strict sense, but a unified collection of articles published earlier, each of which develops the holistic plan of the author. Therefore it is perceived as a systematic presentation of the author's version of biosemiotics, quite comparable to a monograph.

As *LB1* and *LB2* are two parts of an integral composition, the parity of their subjects is clear too — the first book develops the general principles of the author's approach and the second one deals with their application to different biological material.

The essence of the author's approach consists in considering “change from a viewpoint of purely mechanistic biology to a viewpoint of a linguistic, semiotics, communicative biology” (*LB2*: 8; compare *LB2*: 203). It is determined that processes involving DNA are described by means of such linguistic categories as coding, copying, translation, transcription, etc. (*LB2*: 7).

The basis for both of the books is the statement introduced in 1938 by Charles Morris about the three dimensionality of semiosis — the levels of semantics, syntactics and the pragmatics are necessary for the study of sign-mediated interactions (the subtitle of *LB1* is *Contributions to the Foundation of Three-Leveled Biosemiotics*; however it is the connection of these categories with Heidegger-Gadamer hermeneutics that is important for Günther Witzany).

But perhaps the brightest idea of the author is that the living being is regulated by semiotic rules (*LB2*: 13, 15–17, 183) which grow out of some natural or cultural convention⁴ (*LB2*: 10), instead of natural laws (*LB2*: 13, 203 and the section *From Umwelt to Mitwelt*⁵ — *LB2*: 207–226).

Moreover, the author comes to the conclusion that cells, tissues, organs, organisms, etc. require the existence of communicative processes as the interactions mediated by signs are regulated by specified

⁴ Usually this statement is considered to be the basic principle of semiotics. However, the reviewer supports a different view on semiotics.

⁵ Terms by J. von Uexküll who is considered as one of the predecessors of biosemiotics (e.g., Uexküll 1909).

semiotic rules (*LB2*: 203, 227). Thus it appears that such interactions are not formalized and non-algorithmized (*LB2*: 203, 227) because it is the interactions that allow the existence of non-formalizable rules of content-generation (*LB2*: 231).

I believe that this idea about the existence of algorithmized and non-algorithmized semiotic rules is the most significant achievement of the author, and that it has very important consequences.

In my opinion, this idea may serve as the basis for the opposition between semiotics (in the lines of Charles Sanders Peirce and Ferdinand de Saussure) that deals with algorithmized semiotic rules, and hermeneutics, according to which the interpretation arises at the reference to the texts constructed according to non-algorithmized semiotic rules. Accordingly, on the same basis, it is possible to oppose biosemiotics to biohermeneutics⁶. In private discussions and correspondence with the author, we have reached a full mutual understanding on this question. However, there are some terminological complications here.

The problem is that the central category used by Witzany is “communication”. First of all, “communication” is a tool for data transmission. The opposite of communication in this aspect is “communion” (compare Greek *koinonia*) — personal interaction, that is not only utilitarian, but also valuable in itself. Then it would be possible to present a relationship of the basic concepts by the following table:

Algorithmized semiotic rules	Non-algorithmized semiotic rules
semiotics	hermeneutics
biosemiotics	biohermeneutics
communication	communion
biocommunication	biocommunion

⁶ Nevertheless, Günther Witzany refrains from the opposition, preferring to speak about three-level biosemiotics (see *LB1*) in order not to enter in discussions on the ontological problems connected with hermeneutics.

English “communication” can be opposed to a considerable degree to “communion” which can designate the sacrament of communion as well. In that case all the concepts developed by Witzany would have a clear terminological structure. A lack of this categorical network is why it looks very much anthropomorphic. This was the reason why the reviewer (Chebanov 1995) has introduced the term “enlogue” for the designation of interaction like communion between any items (not only between reasoning persons), which has been favorably accepted by Witzany too.

However, in private correspondence Günther Witzany emphasizes that communication in Jürgen Habermas’ (1984, 1987) understanding cannot in principle be understood as defined only by algorithmic rules⁷. That is obvious when we deal with the question of interaction between the artificial languages of science and the language of daily dialogue. Similarly, Karl Jaspers and Karl-Otto Apel understand communication in a non-algorithmic way (*LB2*: 200–202; Witzany studied hermeneutics under Karl-Otto Apel).

In this point, it would seem that everything is clear and there is nothing left to disagree with. However, I think that this is not completely true. Actively working experts could probably understand what is the subject under the discussion, but it is doubtful that an ordinary reader could make this analysis.

From the reviewer’s point of view, the construction discussed above is the most important part — the conceptual kernel — of G. Witzany’s two-volume work, owing to which it reaches the status of a new stage of development in biosemiotics. And its concrete descriptive part is no less fascinating.

Having laid out the new conceptual construction, there only remains the task of tracking this construction in various empirical areas of the discussed subject. This is exactly what Günther Witzany does.

Thus main significance of *LB2* lays in the consideration how the proclaimed principles work in concrete sections of biosemiotic work,

⁷ The structure of this book served as a model for the two volumes by Günther Witzany discussed in the present review.

as they are manifested in different groups of organisms (in the four kingdoms of organisms — in plants, pp.19–56; fungi, 57–84; animals, 85–118; and bacteria, 119–150; but also in viruses — pp. 151–182). Witzany performs the biosemiotic categorization of a great volume of the newest empirical material in order to build the *system of bio-semiotics*.

The table of fig. 1 (LB2: 11) acts as a structural basis for this system. It describes the forms of communication of prokaryotes, protocists, animals, fungi, plants and human beings on intra-, inter- and meta-organismic (interspecific) levels with a special attention to semantics, syntactics and the pragmatics of interaction.

It is necessary to note at once, that the specified sections divided on taxonomic principle are characterized by a considerable volume, fair thoroughness, methodical regularity (manifested in the parallelism of subsections, the consideration of similar schemes, the repeating structure of the argumentation). This definitely increases the argumentative persuasiveness of the work, but it gives some ponderousness to the book and, for example the present reviewer as an author would never dare to go such a way.

At the same time, each section has some findings by the author, which give additional appeal to the book as a whole. Thus, in section 1, *Plant communication from biosemiotic perspective*, the communication of plants is treated as their reaction to the influence of various signals — abiotic and biotic — and different languages of such communication are considered. In this aspect auxin acts depending on the context as a hormone, morphogen or neurotransmitter (LB2: 23). The dictionary of chemical language includes secondary metabolites, neurotransmitters, hormones, etc. (LB2: 24–25). Different levels of interaction of plants are analyzed in a similar way.

Perhaps the most valuable in this section is the attention paid to the root apex (LB2: 21, 23, 35–37) which functions comparably to the brain of animals (see, e.g., Frantisek Baluska's works – Baluska 2006; LB2: 23, 27, 36), and drawing the attention of biosemioticians to this material.

Section 2, *Fungal Communication*, is of special interest because the author is mycologist for his narrower biological specialty. It gives the chance to him to consider a wide range of rather specific questions from the biosemiotics point of view, all of them interesting phenomena from the point of view of general biology: for example, lichens (LB2: 63) and other kinds of fungal symbiosis (LB2: 63–67) as well as the semiotic aspects of infection of fungal mitochondria by double-stranded RNA or DNA viruses (LB2: 75–77).

According to the composition of the book, Section 3, *Coral Communication*, has to represent the three-level semiosis in animals. Such composition has turned out to be very successful for two reasons. First, having refused the claim to present all completeness of semiotics processes in animals, the author releases himself from the necessity to retell banality. Secondly, having chosen not simply corals, but the processes of communication during their morphogenesis, Witzany has an opportunity to discuss the newest data on this subject, which has become one of the models for molecular genetics of morphogenesis. Thus he pays special attention to the archaism of this group (LB2: 103) thanks to what the results obtained can be transferred on to a rather wide circle of more highly organized animals.

Section 4, *Communicative competences of bacteria*, concentrates first of all on the claim that for bacteria the key characteristic is not unicellularity, but rather the formation of multilevel supercellular units — biofilms (LB2: 120–122) — connected to inter-level communication and epigenetic relations (LB2: 121). Such statement forces us to pay special attention to different types of symbiotic relations between bacteria. Thus, the focus is not on the classical characteristics of bacteria as prokaryotes, but on the fact that the organization of their genetic systems defines the large role of horizontal transmission of the genetic material (LB2: 125–133) carried out by viruses (LB2: 134–135). Thus the viruses perform natural editing of the genome (LB2: 138–141).

The idea of natural editing of the genome is a basis for the two following sections of the book. Section 5 is specially devoted to the ability of viruses to perform natural editing of genomes, and Section 6

is devoted to a statement on the original theory of serial endosymbiogenesis (*LB2*: 188–199). The latter is some kind of a synthesis between popular representations about symbiogenesis by L. Margulis and the ideas of V. A. Kordjum about the role of viruses in global transmission of the genetic information by transduction on the basis of three-level biosemiosis. In this context it becomes clear why the author paid so much more attention to different types of symbiotic relations in the previous sections.

The material discussed above allows us to assert that before us is a rather uncommon book which very clearly formulates indisputable basic principles of biosemiotics. Of special interest is the attempt to construct the *system of biosemiotics* which, as well as many other things in biology, is constructed on taxonomic principles. An additional appeal is given to the book by the inclusion of various very new empirical data. It is quite clear that a part of the interpretations is debatable. The idea of serial endosymbiogenesis is debatable, too. Nevertheless it gives completeness and symmetry for the whole conceptual construction, generalizing very diverse empirical and theoretical materials.

On factography

I approached the two books with a great expectation: I know Witzany as an enthusiastic propagator of a new view of life.⁸ He developed a three-level model of communicative processes (intra-, inter-, and meta-organismic), as well as a system of syntactic, pragmatic, and semantic rules reigning the living.

Browsing through both volumes reveals that they are not compiled as monographs: with the exception of two Introductions and one Epilogue they represent a collection of author's previous works. Of 205 pages of *LBI*, 85 comprise reprints of two chapters from his earlier

⁸ Witzany 2000; a translation of a German original published in 1993. This book is, to a great extent, a collection of author's older papers.

book (Witzany 2000); the rest of *LB1* is a collection of 6 papers published in various journals and proceedings in 1990s and 2000s, united only by the Introduction (11 pages). Of seven chapters of *LB2* only two were not published elsewhere. I do not criticize reprinting older works, even outdated, when the author states what is the objective of doing so. Here, however, the absence of comments or amalgamating text is quite a drawback:

(i) No comments are given to anachronisms, especially concerning papers from the early 1990s. We read, e.g., about Vollmert's theory from the 1980s on evolution driven by DNA prolongation, accompanied by emergence of new genes. Witzany of course must know that later achievements in genomics have not validated the theory, but makes no attempt to comment or correct on the reprint.

(ii) *Redundancy* is very annoying throughout the reading, especially in *LB2*, where several chapters are built according to a common scheme, with almost identical diagrams in each. Obviously, reviews on plant, fungal, coral, bacterial, or virus-mediated communication, when published in different special journals, allow such a strategy, but piling them up in a single volume calls for an extensive editing. The same holds for many *clichés*: For example, a grievance that most biologists take non-coding DNA for "junk" (completely untrue in my opinion), became a mantra repeated over the texts.

(iii) Technical language. If you send a review to, say, *Plant Signaling and Behavior*, you will expect that its readers are in command of special terminology of plant sciences. No such expectation is allowed in a collection bringing together so many multifarious subjects. Consequently, a glossary of basic concepts should be an obvious part of both volumes, especially when taking into consideration the specific style of the author, as will be discussed below.

This mosaic character of the collection is in a fractal-like manner retained also at the level of texts proper. Often paragraphs follow each other without any link-up; and even sentences in a single paragraph follow each other without any clear context, as if copied and pasted from different resources they refer to. Moreover, very often the reader

has an impression that there is no feeling for different levels of knowledge: banal textbook truths and concepts are served intermixed with very special factography — even within a single paragraph — with each sentence furnished copiously with a reference to some article or book. Peculiar is also the selection of references. Of course, the author has the right to choose any work in support of his point, but it should be clear that he knows also the mainstream views, and he should give reasons why he prefers the alternatives. For example, when speaking of endosymbiotic theory, he keeps referring to (somewhat outdated) views of Lynn Margulis, but no reference is given to more recent and well-elaborated mainstream research.

To support my not very amiable statements, I give below a closer parsing of Chapter 5 from *LB2*. It starts with very ambitious statements (my italics):

It is becoming increasingly evident that the driving forces of evolutionary novelty are not randomly derived chance mutations of the genetic text, but a *precise genome editing by omnipresent viral agents*. [...] Non-coding, repetitive DNA sequences [...] are now recognized as being of viral descent and crucial for higher-order regulatory and constitutional functions of protein structural vocabulary. (Witzany 2007: 151)

The author argues that this editing proceeds according to 3-step competences (syntactic, semantic, and pragmatic) which are characteristic for viral particles. The abstract of the chapter ends with the statement:

There is growing evidence that *natural genome-editing competences of viruses are essential* (1.) for the evolution of the eukaryotic nucleus (2.) the adaptive immune system and (3.) the placental mammals. (Witzany 2007: 151–152)

The reference list of the article contains 75 items, my counting says that there are 140 in-text links. Out of these, however, 60 refer to two works only: one book and one paper (a review on the same topic) by Luis P. Villarreal; hence, most crucial statements rely to this single author.

We get a short introduction about non-coding DNA in eukaryotes, and come to part 2 discussing the role of non-coding regulatory networks in the genome. I give an illustrative paragraph (sentence numbering is mine, number of references in square brackets):

[1] Clearly, mobile sequences such as transposons and retroposons^[ref] and non-coding repetitive elements [...] enable far-reaching DNA rearrangement and reorganization^[4 refs]. [2] Together, they play a decisive role in the evolution of new genomic structures^[4 refs]. [3] Depending on the organism's state of development, the varying chromatin markers are, thus capable — through different methylation patterns, histone modifications and alternative splicing — of creating a set of “multiple protein meanings”^[ref] from one and the same genetic data-set^[8 refs]. [4] This even characterizes the rise of epigenetics, i.e. the view that phenotypic variations, which are heritable, need not be connected with genetic alterations^[5 refs]. [5] The question arises as to how and why the evolution of higher genetic complexity is connected to non-coding DNA, formerly termed “junk”-DNA? (Witzany 2007: 153)

If you take first three sentences separately, they are true; but how does the sentence (3) follow from the first two? Does it suggest that chromatin markers arose by genome rearrangement and reorganization? What are those elusive chromatin markers? What *I* took for chromatin markers, i.e. “different methylation patterns, histone modifications and alternative splicing” are here but epiphenomena of true markers. How such markers create “multiple protein meanings”? I supposed that such meanings are given by previous history of the cell body and the state of protein “ecosystem” in it. Epigenetic states create themselves, they are not created genetically — after all that is why they have got their name. The sentence (4) makes little sense: epigenetics is not a view, and “the view that phenotypic variations, which are heritable, need not be connected with genetic alterations” is more than one century old, thus does not follow from the knowledge of transpositions. The last sentence suddenly introduces yet another motif: it takes us from the realm of ontogeny into evolutionary processes.

Enough of illustrations; the reader can continue with the following paragraph, which connects “enzyme proteins” with DNA editing as

tools for — actually, what?; continues with the list of processes in chromatin; with Watson allegedly inventing in 1992 what was already a textbook knowledge at that time; up to “linguistic features of non-coding DNA”. The section ends with a statement that “natural genetic engineering” is different from “artificial” one, because “The former provides ontologically genuine products that are evident in all living beings and life processes, whereas the latter attempts to achieve modifications and improvements by copying the natural genome-editing competences” (Witzany 2007: 155). What have we learnt so far?

Part 3 of the same chapter — ‘Major viral life-strategies’ (pp. 155–158) — relies almost completely on the above-mentioned works by Villarreal. Again, we get sudden jumps from retroviral (and their derivative) composition of human genome, to virus abundance in the ocean water, to general information about viral types and the strategy of their reproduction. We learn that “viruses can parasitize almost any replication system — even prebiotic ones — and probably emerged well before the appearance of cellular life forms” (?), yet “most viruses, however, are stable, persistent living beings that do not colonize a host organism for simple selfish purposes” (Witzany 2007: 156, 157). The term fitness must be modified, on the base of the statement that “The fact that viruses are silent companions of virtually all organisms and that they play a decisive role in the evolution of the host has been largely ignored” (Witzany 2007: 157–158).

I skip analyzing part 4 on strategic patterns of viruses — I simply cannot understand it — and move to part 5: ‘Pre-cellular viral life’. Somehow I did not get any information of how could viruses endure in a world without cells; instead I read about “RNA proteins”, “DNA transaction proteins”, “DNA viruses infecting RNA viruses”. We move now to the main body of the text, consisting of parts 6, ‘The origin of eukaryotic nucleus’; 7, ‘The origin of the adaptive immune system’; 8, ‘The evolutionary innovation of placental mammals through endogenous retroviruses’. From reading these parts I understand that L. P. Villarreal is of opinion that retroviruses are responsible for all that, and that Witzany agrees with him. But this is a summary — the text itself will not allow such conclusions.

I know Günther Witzany personally and know that our views are very close. I also emphasise the semiotic and hermeneutic nature of life, of which contemporary biology is but one possible projection. Yet I feel that uncritical piling of biological facts is not the way to persuade our learned colleagues — in biology or elsewhere.

References

- Baluska, Frantisek; Mancuso, Stefano; Volkmann, Dieter (eds.) 2006. *Communication in Plants – Neuronal Aspects of Plant Life*. Berlin: Springer.
- Chebanov, Sergey V. 1995. Enlogue as Quasipersonal Interaction: Biohermeneutic Issues. *European Journal for Semiotic Studies* 7(3–4): 439–466.
- 1998. Totality of semiosphere. (Review: Jesper Hoffmeyer. Signs of Meaning in the Universe.) *Sign Systems Studies* 26: 417–424.
- Habermas, Jürgen 1984, 1987. *Theory of Communicative Action*, vols. 1 and 2. Boston: Beacon Press.
- Kordjum, Vitali A. 1982. *Evolution and Biosphere*. Kiev. [in Russian]
- Uexküll, Jakob von 1909. *Umwelt und Innenwelt der Tiere*. Berlin: J. Springer.
- Witzany, Günther 2000. *Life: The communicative structure: A new philosophy of biology*. [A translation of a German original published in 1993.]
- 2006. *The Logos of the Bios 1: Contribution to the Foundation of a Three-Leveled Biosemiotics*. Helsinki: Umweb.
- 2007. *The Logos of the Bios 2: Bio-Communication*. Vilnius: Umweb.