



Review of Ph.D. Thesis of Jana Švorcová:
Organic memory in embryonic development

The submitted PhD dissertation comprises some 70 pages of text, 8 pages of literature resources, it also includes two already published original papers and one (probably also accepted) book chapter. From these reviewed contributions, the first one (Markoš and Švorcová: *Recorded versus organic memory: interaction of two worlds as demonstrated by the chromatin dynamics*) was published in *Biosemitotics* already three years ago and both authors contributed equally to this communication. The paper deals with the organic memory idea from the epigenetic perspective of chromatin and DNA modifications. Also, the concept of interactions between the natural (bodily) world and the world of digital codes is introduced. The second paper, Švorcová (2012): *The phylotypic stage as a boundary of modular memory: non mechanistic perspective* was published in *Theory in Biosciences* this year and it argues that the organic memory is activated after the conserved (phylotypic) stage when development becomes (more) modular. It somehow combines Barbieri's concept of supracellular memory with a semiotic perspective and with some (rather strong) ideas of modularity during development. The last paper added to the Thesis, entitled *Living as languaging: distributed knowledge in living beings*, was written by Markoš, Švorcová a Lhotský, and represents a nice piece of writing about levels of meaning in biology, about a lived world around us, when utilising the language metaphor of life, and should appear this year.

The Thesis deals with the topic of organic memory, its history, definition and perceptions, relating and contrasting this kind of memory to other memory conceptions. The author, according to her own words, studies organic memory as a biological hypothesis, however, throughout the text it is argued from semiotics perspectives and some rather strict language metaphors are being applied. Following some few authors that have been working with such terms but elaborating (mostly) Barbieri and Markoš conceptions, the candidate finally introduces her own model based on a language metaphor of life of what organic memory is, how information is being stored, utilised and interpreted by the organic bodies to develop and evolve. The so-called organic memory in her own conception thus signifies more than a mechanistic storage of representations and cannot be reduced to a single level of permanent code like DNA strings. Rather, the organic memory, as presented, is primarily bodily and without any strict localisation. The memory of this kind is "stored in the pattern of the interactive networks of rules which are enhanced by every usage". Formation of this kind of diacritics over the substrate of the basic genetic text can – according to the author – radically change the meaning of the genetic string of information. Moreover, these networks are thought to be capable to change their pattern as a function of experience. In general, the whole conception

presented in the Thesis stems from the assumption that even on the level of cellular interactions there are constant games of language and that the organic memory presented is radically distributed, bodily and experience-dependent memory of all-living creatures.

The Thesis itself is written in very good English and it is well organized. However, the key Chapter 6 (*Developmental memories*) and 7 (*Discussions*) seem to me to include too much of the text directly assumed from published papers of the author. There are several pages that consist exclusively from the cited text and assumed images. For example, the very first page of Discussion (p.60) (which also epitomizes the entire first subchapter 7.1.) is just fully copied from the Švorcová 2012 paper. Discussion subchapters 7.3.1. and 7.3.2. (p. 63–65) are but one paragraph fully cited from Markoš and Švorcová 2009. There are also many other pages (often going one after the other) with a substantial amount of directly cited text. The author should generally avoid this, especially when claiming that the three papers added at the end of the Thesis represent an "integral part" of the Thesis. Interestingly, I was also highly surprised to see the Thesis to be printed only on one side.

In general, when reading it through I was constantly thinking as whether the Thesis is ingenious since the author is opening new horizons for novel reflexion of some rather central topics of current biology, or whether this represents just another theses in philosophy of science that no scientist will ever read or get interested in. For example, shall we anticipate some hierarchical system of genetic, epigenetic and organic memories with rather dissimilar nature of each level? The central issue that the author should try to illuminate more is according to me a relationship between the organic memory and epigenetic systems of information. There are of course no doubts about differences between genetic and epigenetic systems, but what is a posture of organic memory? Shall we expect some kind of semiotic or hermeneutic turn in post-modern biology or would we like to merge these conceptions into a single one? The author uses on one hand very specific scientific language when talking about genetic or epigenetic systems (like *transcriptional activation, upstream factors, regulatory sequences, downstream genes*, etc), but the organic memory is explained using rather elusive or imprecise language when stating, for example, that the organic memory is "stored in patterns of the interactive network of rules" and "written in cellular language". The author states, when dealing with semiotic perspective of developmental memory (Švorcová 2012), that it of course remains an ontological claim to be tested and developed further. I am looking forward to see that.

By these topics on the border between Science and Philosophy of science this Thesis undoubtedly ranks among theoretical and evolutionary biology and with all respect to its length, sound explanations of rather novel concepts and also generally high quality of the text including several already reviewed outcomes I have no doubts that the author fully deserves the title Philosophy Doctor (Ph.D.).

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