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Semiosis stems from logical incompatibility in organic nature: Why biophysics does not see meaning, while biosemiotics does

Kalevi Kull

Department of Semiotics, University of Tartu, Jakobi St 2, Tartu 51014, Estonia

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ABSTRACT

We suggest here a model of the origin of the phenomenal world via the naturalization of logical conflict or incompatibility (which is broader than, but includes logical contradiction). Physics rules out the reality of meaning because of the method of formalization, which requires that logical conflicts cannot be part of the model. We argue that (a) meaning-making requires a logical conflict; (b) logical conflict assumes a phenomenal present; (c) phenomenological specious present occurs in living systems as widely as meaning-making; (d) it is possible to provide a physiological description of a system in which the phenomenal present appears and choices are made; (e) logical conflict, or incompatibility itself, is the mechanism of intentionality; (f) meaning-making is assured by scaffolding, which is a product of earlier choices, or decision-making, or interpretation. This model can be seen as a model of semiosis. It also allows putting physiology and phenomenology (or physics and semiotics) into a natural connection.

The connection of the physical with the phenomenal has been one of the most difficult problems for theoretical biology, as well as for philosophy and the sciences at large. For example, Evan Thompson (2007) has reviewed some earlier research in this field. Here we describe a further step in modelling the biological roots and nature of the phenomenal, demonstrating how and why the phenomenal present appears together with the cognitive and semiotic capacities in living systems.

Jakob von Uexküll (1940: 1) accused the physicalist biologists of *Bedeutungsblindheit* — blindness of meaning. They are, he says, like chemists, who analyze a painting chemically without paying attention to what is the nature of the painting. Indeed, the physical methodology, as it describes all processes on the basis of computational models, does not need the concept of meaning. Moreover, it does not possess tools to study it, to state it. For physics, wavelengths and frequencies are real, not the colours as seen.[1] Physics does not require qualia.

The reason for this situation is not the fact that physics and chemistry are somehow incomplete and need to learn to study meaning within their object field. The whole situation has more fundamental roots. As we are going to demonstrate, one of the basic assumptions (or requirements) used in physics, biophysics included, rules out meaning-making. Biophysics makes perfect models, but if we want to accept the reality of smells and meanings, the study of life has to be complemented with a methodology that can work with these; semiotics — the scientific study of meaning-making — at least claims that it can.[2] Only via the theories that accept the reality of meaning can meaning be a scientific concept in biology. And in addition to this, as Hoffmeyer (2008: 181) says, "The experiential component of life, *qualia*, is thus seen as an integral aspect of life as such — an aspect that has had its own evolutionary history from its most primitive forms in prokaryotic life to the sophisticated kinds of umwelten that we find in big-brained animals".

1. Necessity of logical incongruence

First, let us point to the observation that there is no meaning creation in logically congruent systems. This is because a logically congruent system works like a "machine", works lawfully, works "without problems". If a machine gets broken, it is not a problem for the machine but only for its user. An error-correction that a

[1] For instance, Erwin Schrödinger (1967: 119) has said: "Colour and sound, hot and cold are our immediate sensations; small wonder that they are lacking in a world model from which we have removed our own mental person. […] The material world has only been constructed at the price of taking the self, that is, mind, out of it, removing it".

[2] On this methodological comparison, see, e.g., Kull 2007.

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computer can do is the process of a human-designed algorithm that removes certain bits seen as errors from a human point of view. Meaning may appear only in systems in which something sometimes goes wrong, or where errors themselves can appear.[3] Errors only occur *for a living being* (i.e., that which is not made by life cannot make errors). Wherever a molecule, or a planet, moves, it does not in itself err. And if errors cannot be made, then the concept of meaning is unnecessary.

The assumption that eliminates meaning from an object under modelling is the logical congruence built in and required by models, or the dismissal of logical incompatibilities in the model of the world. However, the achievement of logically consistent models is preceded by the removal of logical conflicts, thus the latter do exist, at least at a certain stage. Same as ourselves, we humans, the other living beings also build and use models in their umwelten — therefore they may also have logical conflicts.[4] Thus we need to study logical conflicts as these appear in living systems.

It can be noticed that a certain logical incompatibility is what happens in a dialogue, but it is also a precondition for any dialogue, for meaning-making, and for meaningful communication (also, for autocommunication). This is because dialogue takes place if there is certain qualitative difference between the communicants, if something is not clear or incongruent. Similarly, such logical incompatibility is a condition for the functions and adaptations as processes studied in biology. Seemingly, logical conflicts or semantic *incompatibility* may appear frequently in living 'beings' behaviour. Yet the difficulties in formalization of these phenomena are symptomatic, because most of the existing models of biological adaptations do not include the reality of meaning.

What makes *meaning* different from physical causes and effects is that meaning is a real possibility or option — a possibility that does not have a probabilistic determination in the physical sense of probability.

There exist some approaches to studying the primary mechanisms of meaning-making worked out in semiotics and, as related to biology — such as biosemiotics. Semiotics is the study of the processes which constitute logic in a broad sense (focussing on preformal logic, or on interpretation processes of any type) — in culture, in languages, and in communication, both human and nonhuman. Thus, a real hope to reveal a solution to the mechanisms of the phenomenal lies in the use of semiotics.

2. Models of semiosis

A good review of some models of semiosis (defined as a sign process that is responsible for meaning-making) has been provided by Martin Krampen (1997). He described over ten different models, some of them named as models of communication. Krampen also distinguishes between models of *semiosis* (which describe the processuality of meaning making) and models of *sign relations* (which describe the structure of relationships between the components of semiosis). In recent decades, most popular among these have been Charles S. Peirce's and Jakob von Uexküll's models of semiosis. Peirce's model is a phenomenological (phaneroscopic) generalization of logic and emphasizes the irreducibly triadic nature of semiosis. Uexküll's model is based on physiological knowledge of organisms' behaviour and describes semiosis as a functional cycle. In addition to these, Juri Lotman's model of communication should also be pointed out as one based on dialogic processes of generalized translation, emphasizing a partial non-translatability inherent in semiosis.

It is remarkable that despite many efforts, none of these models have been successfully formalized. As we see it, this is due to the same reason that meaning is inaccessible to physics. In order to model semiosis, we need to model the logical incompatibility in flesh.

3. Operations

Many processes of living systems can be described as operations of the general form IF *a* THEN DO *b*, where the connection between *a* and *b* in the process is not deducible from the physical or chemical laws, but is *acquired* through history, evolution, learning, compiling — i.e. by some process in the living realm.

What is indeed characteristic of living systems is that they can preserve various things linked that would not become repeatedly linked by self-assembly.[5] That is, making and preserving arbitrary links is a specific feature of living systems — and also, of semiotic systems.

For instance, a substance *A* outside a cell (e.g., an odorant) can be regularly linked to substance *B* inside the cell (e.g., cAMP) via an action (operation) through a signal transduction enzyme, while *A* and *B* may have nothing in common in a chemical sense — they may not interact at all in case of direct contact (or may interact differently). The mediated specific linkage can be regular due to the mediator(s) whose persistence is guaranteed for a long time via self-copying of the structure of the mediator, e.g. with the help of the genome.

Another example could be the genetic code. For instance, it includes an operation IF *triplet AGU* THEN DO [attach] *serine*. This operation is mediated by a specific tRNA. Each tRNA provides and keeps an operation, while around 60 of them together make up what is called a genetic code.

Besides these mentioned, there are many stimulus–response processes operations, including both unconditioned and conditioned reflexes that take this IF *a* THEN DO *b* form. Habits can likewise be seen as such operations.

The operations IF *a* THEN DO *b* are not themselves semiosis, for reasons that we will discuss shortly; however, they are usually products of semiosis, or rather, they are a type of degenerated semiosis — semiosis that has evolved into a habit (and thus lost its meaning making capacity).

All habits are products of semiosis (and in becoming automatized, they become a degenerated form of semiosis). Habits as well as other operations can be thus seen as *codes* in the sense that Umberto Eco (1976) gives them.

Moreover, in order to work regularly, i. e., persist, the mediator of an operation (that which really connects *a* and *b*) has to be restored either via self-copying or by some other kind of memory. We see this both in protein synthesis and in neuronal 'hard-wiring'. Both, too, can be the products of earlier acts of semiosis.

Semiosis almost always presupposes semiosis (*omne signum ex signa*[6]). However, simple operations like metabolism–repair systems (*M*, *R*-systems) as described by Robert Rosen, could initially appear *de novo*, in the process of the natural origin of life. Thus the origin of habits and other stimulus-response operations is not completely closed in the world of self-production of semiosis.

The most important point about such operations in our context

[3] Cf. T. Deacon's (2012) account which describes this feature as the incompleteness (or the reality of absence) in a meaning making system.

[4] By logical conflict we mean incompatibility that is much broader than logical contradiction (but that includes the latter as a special case). This may occur before and without the operation of negation.

[5] On the concept of self-assembly in this sense, see Deacon 2012.

[6] "Le principe *omne signum ex signa* est pour la psychologie du langage ce qu'est pour la biologie le principe *omne vivum ex vivo*" (Guillaume, 1968[1942]: 88).