

The 'surplus of meaning'. Biosemiotic aspects in Francisco J. Varela's philosophy of cognition

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Abstract

The late Chile born biologist Francisco J. Varela has been influential in theoretical biology throughout the last three decades of the 20. century. His thinking shows a marked development from a biologically founded constructivism (developed together with his fellow citizen, Humberto Maturana, with the main key word being "autopoiesis theory") to a more phenomenological oriented standpoint, which Varela called himself the philosophy of embodiment, or "enactivism". In this paper, I want to show that major arguments in this latter position can be fruitful for a biosemiotic approach to organism. Varela himself already applies concepts as e.g. "signification", "relevance", "meaning" which are *de facto* biosemiotic. He derives these concepts from a compact theory of organism, which he understands as the process of self-realization of a materially embodied subject. This presumption stems, though somewhat modified, from Autopoiesis theory and so attempts a quasi-empirical description of the living in terms of self-organisation. Varela's thinking might count as an exemplary model for a biosemiotic approach in a theory of organism. In particular, Varela's link to down-to-earth biological research offers means to associate biosemiotics with the ongoing debate about the status of a biological system within genetics and proteomics research.

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„I want to start declaring that I think that understanding of organisms and the living is possible, that defining these terms in a satisfactory manner is not a utopian dream, and that we even have a good deal of the road already charted. However, this is under a fundamental condition: that the autonomy of the living is highlighted instead of forgotten, as it has been.“²

1. Introduction

It seems crucial for the further development of biosemiotics, to be grounded most tightly in a solid biological account. What is required, are empirical observations of how self-organising systems are bringing forth signs, and how they make work the molecular context of the body in semiotic terms.

The philosophy of Francisco J. Varela provides an important source for such an undertaking. His work has never lost its contact to empirical experiment. It is a bridge between research in biological cognition, and a completely original account of what the phenomenon of life is. Most interestingly, some of Varela's most influential contributions to this field are already expressed in biosemiotic or at least "cryptosemiotic" (see Sebeok, 1976, for this expression) terms, apart from other, more phenomenological points which stand in a looser contact to biosemiotics proper and hence are not subject of this essay.

Francisco Varela's work might help explain semiotics from the basal fact of organic life making. It could provide a possible way to understand the transition from a purely cognitive level to a semiotic one. Varela's description of the "patterns of life" is in fact the reconstruction of a semiotic nucleus. In such a view, semiotics is coexistent with life, because life always is embodied cognition, giving rise to a world of relevance. However, Varela himself did not absolutely share these consequences. He was always reluctant about semiotics, seen the relatively formal design, which the discipline acquired under the influence of Eco (e.g. 1976). *Avant la lettre*, one might thus say, Varela has written a biological foundation of (bio-)semiotics. His work shows a close association of the fields of embodied cognition, biological phenomenology, and semiotics, conflating in what could best be called a biology of subjective agents, or short, *subject-biology*.

2. Biological constructivism and beyond

Varela's ideas about organism set off from the concept of autopoiesis, which he developed as a young scholar together with Humberto R. Maturana. Since then it has mostly be known under the label of "biological constructivism". I will discuss these

² Varela, F.J. (1997): „Patterns of life: Intertwining identity and cognition“. *Brain and Cognition* 34, S. 73.

roots here in some detail. This is necessary because later Varela has much shifted accents in his view on organism. He tried to escape some of the less desirable consequences of his early theories, a parting that gave rise to the intellectual separation of the former co-authors. Maturana stayed on a more mentalist, less embodied account of cognition (Maturana 1987), whereas Varela moved to what he later called “enactivism” and which is coming much closer to biosemiotics.

Biological constructivism, which Varela and Maturana developed in the 1970s (Maturana & Varela 1980), was an attempt to overcome the philosophical fission of the phenomenal world. The authors tried to conquer the dualistic gap between objects and perceivers, or things and subjects, that has haunted philosophy since early modern times. Instead of a neat separation of perceiver and perceived, Maturana and Varela argued that the structure of favouring phenomenal worlds is created by the biological structure of an agent that has to make a living in this world.

In biological theory, dualism means the dominant understanding of the living as molecular-genetic and, complementary, the process of mind and cognition as information processing. What is missing, for Maturana and Varela seemed to be the fact that an agent realizes the living actively. An organism is an autonomous being that does not encounter the world passively, but experiences it as a meaning. Maturana and Varela hence tried to synthesize what could be said to be the minimal form of autonomy consistent with modern cell biology, with the emerging studies on self-organization and systems research circulating at the time (von Foerster, Rosenblatt, McCulloch, Wiener)³.

The result was autopoiesis theory. A living being is an autopoietic entity, which is characterised by the fact that it is literally producing itself (*autopoiesis* is derived from the Greek, meaning “self-creation”). The particular character of the autopoietic system is that the cell’s metabolism brings forth entities that will feed back materially, i.e. integrate into the network of transformations which has brought them forth (Maturana & Varela 1987:50).

A living system hence creates itself and its components in certain autonomy from its surrounding world, and does so even against external gradients. Differing from dissipative model systems and from all other self-organising reactions (and, as we will see later, also from self-regulating artifacts), organisms are defined by their active behaviour in searching food, escaping danger and generally keeping up their integrity against external influences.

Regarding cognition, the active self-realization means that an organism is not concerned with any external events, but only with the circular process of bringing

³ For historical background information see Varela 1996.

forth itself. The external world is hence constructed by means of the inner, biological structure of the living agent. This holds true as a principle also for higher levels of integration: not only the cellular metabolism, but also the nervous system is closed. It brings forth only its own inner states, which can be stimulated by the environment, but may not be influenced causally in an unambiguous way. The nervous system does not receive “information”. It rather creates a world by defining which configurations of the milieu are stimuli (also called, as we will see below, “perturbations”). This interpretative world making is the only way, which can provide “information”. Autopoietic agents create a world by their actions (Maturana & Varela 1987:185)

This solution was a neat reformulation of Kant’s transcendental philosophy in the guise of an empirical theory of cognition. Subjects perceive the world by means of phenomena, “Erscheinungen”, which are determined by the biological (and not longer, as in Kant, transcendental) conditions of being a subject. Biological constructivism hence can be said to put Kant onto a biological foundation and to corroborate his transcendental philosophy by means of natural sciences. The reality is constrained by the biological conditions of any possible knowledge. World is not objective but relative to the biological organisation of the perceiver.

The problem here, which led to a crisis in autopoietic theory, was already a difficulty for Kant. If subjects bring forth their own cognitive worlds, how can we avoid solipsism? How can communication with fellow beings be possible, which obviously is a most central fact of life? In the first presentations by Maturana and Varela and in Maturana’s later work, it seems of no importance how the external world is structured, and if there is *something* at all. Thus, Maturana and Varela (1987:149ff) come to compare the situation of the perceiver to that of a submarine-driver who relates to the external world only by means of his navigation equipment. He experiences reality only as a technical translation, a construction achieved by means of his instruments. Reality here could as well be the fiction of an evil demon fed into the instrument’s sensors. The subject is unable to act back on its surrounding world. We can see that by this construction, dualism, which autopoiesis theory was conceived to weaken, is rather reinforced (see also Maturana, 1987:89-118).

Varela in his more recent works does no longer so much emphasize the hermetical dimension of autopoietic systems. An important facet of a living being’s reality still remains in the fact that this reality is created by the being’s own world making. However, on Varela’s “middle way of knowing” between constructivism and representationism, the world as a material and energetic ground is always present. It is even vitally necessary as the source for an existential coupling, which specifies both agent and Umwelt. Instead of emphasizing construction, Varela later prefers to speak of enacting, of a “mise en scène” (Varela 1997). The resulting philosophical position is “enactivism” instead of constructivism, thus confronting the crucial question of “the other” (Varela et al. 1991) that only few positions in continental

philosophy have dwelled upon so far. In the following, I will be summarizing this new position.

However, let me observe before that by this turn to the “exterior”, in the work of Varela we can witness the same movement, which also Kant finally took in his life’s work. Kant had all the time tried to reconcile the empirical variety of experience (and of objects) with the existence of a transcendental (we would say: constructivist) subject. But only in the third of his critiques, in the Critique of Judgement, he achieved a kind of preliminary unity between subject and experience, the link, which he was so eagerly looking for. But to be consistent with the premises of his transcendental, “un-embodied” critical position, Kant had to pay the price of admitting a “happy chance” in the fitting of human perception to the world of objects (Lenoir 1982).

In the second half of the Critique of Judgement, Kant is concerned with organism and its apparently teleological organisation. To reconcile transcendental subject and experience, it seemed necessary for Kant, to admit a teleological description of organism, even if it contradicted the findings of the earlier critiques. Thus, Kant elaborated his somewhat ambiguous and indecisive position about teleology in biology, which has aroused so much confusion until today. But, in relation to autopoiesis theory, teleology might be seen in a new light. As Varela and Weber (2002) have shown, the enactive turn of autopoiesis can provide an explanation for “intrinsic teleology” and so strengthen out Kant’s position to this side. We then have in autopoiesis, by its intrinsic teleology, along with its constructivism, a double naturalization of Kant.

As we will see below, this explanation of teleology from the standpoint of an embodied phenomenology, can in turn be transferred to a biosemiotic account. As already Peirce showed, both semiotics and teleology are triadic forms of relations (Weber 2001a, but see also below).

3. The process of establishing an identity

For Varela, organisms enact the world they are living within by the process of their auto-constitution. In the very process of self-creation they put onto stage their proper—and in these terms their real—world. With this in mind the shortest definition of organism is: „Organisms are fundamentally a process of constitution of an identity.“ (Varela 1997)

For autopoiesis theory, the process of the living consists in bringing forth this proper process. Living is ended not when its chemical compounds are changed, but when the process of auto-maintenance is disturbed. What does this auto-creation of a unity mean on a concrete biological level? Varela characterises living beings by the fact that they literally produce themselves. An organism brings forth its structures as well

as its own border. It is the production of an order which produces exactly the components that have produced the order:

„An autopoietic system—the minimal living organization—is one that continuously produces the components that specify it, while at the same time realizing it (the system) as a concrete unity in space and time, which makes the network of production of components possible. More precisely defined: An autopoietic system is organized (defined as unity) as a network of processes of production (synthesis and destruction) of components such that these components (i) continuously regenerate the network that is producing them, and (ii) constitute the system as a distinguishable unity in the domain in which they exist. (1997:75)

It is important to keep hold of the detail that the living entity exists as a certain identical structure in space and time, although at the same time it is at no moment materially identical with itself. The living entity thus has a strangely virtual aspect; the actual material being is in a way the product of this virtual facet, although both are in any moment also identical. Only the fact of being alive keeps this circuit closed. When an organism dies the process comes to an end, the components behave as normal chemical compounds and decay.

It should be clear that the distinguishing characteristic of a living being is its nature as a process or even a network of processes. An organism brings forth its own structure and limits itself as a distinct entity. Its identity consists thereby exactly in bringing forth this identical ‘self’. Without the process of this steady auto-production, the entity would immediately collapse.

Obviously, the organization of the living is characterized by a strong circularity and a conflation of two rather different ontological realms. The organism’s proper reality unfolds as a dialectics of pure matter and structural regulation. This process circularity is a fact, which biology has discovered in the field of complexity science emerging since the 1960s and with today protagonists as Kauffman, Goodwin, Rose and Salthe. There is nothing vitalist in the view of emerging circularities; even many chemical reactions display self-organizing behaviour (Prigogine & Stengers 1990). The process of the living happens on normal matter—only that this is organized in such a way that it comes to autopoietic behaviour.

(Findings like these call for a more detailed investigation in the direction Weber and Depew (1996) pointed out. They proposed the existence of a large framework of structural rather than causal laws in biology, causal models as Darwinian evolution being rather a subclass of a deeper structural grid providing certain creodes of self organization.)

As a model autopoietic system, we can regard a prokaryotic cell. Although it is rather simple, it retains a certain incontestable ontological unity and shows already the full behaviour of a living being. Although model systems (as in Varela 1991) help to illustrate how Autopoiesis works, its essence can only be observed in a living cell. This is thus by far superior to any artificial 'minimal autopoietic system' as a philosophical object of investigation. Only the living cell is autonomous in its active uptaking of nutrients. It is not dependent on an experimental setting to continue. So far, such a system has not been simulated. What is distinguishing an organism from any simulation is this active concern about itself. Therefore, autopoiesis is not a system theory of biological entities in a common sense, nor a mere variant of self-organisation theory:

"In its original formulation as well as in the subsequent literature it has been common to see the central concept of autopoiesis as just one more self-organizing mechanism (which it undoubtedly is), and even to conflate it with dissipative structure or autocatalytic cycles, or mere open systems. These ideas basically stay within the perimeter of a physicalist view of nature and understand these new developments as necessary extension of classical physics. However there is an essential difference between these views and autopoiesis: autopoiesis proposes an understanding of the radical transition to the existence of an individual, a relation of an organism with it-self, and the origin of "concern" based on its ongoing self-produced identity. One could envisage the circularity metabolism-membrane entirely from the outside (this is what most biochemists do). But this is not to deny that there is, at the same time, the instauration of a *point of view* provided by the self-construction". (Weber & Varela 2002)

By creating the self in a process of unfolding identity, the organism brings forth its surrounding world as the 'other' of its self. Between the organism and the world thus brought forth, exists a certain paradox. The living creates its surroundings, and consequently is rather autonomous. However, at the same time it is still depending on these surroundings as a material source of its real existence:

„Organism connotes a knotty dialectic: a living system makes itself into an entity distinct from its environment through a process that brings forth, through that very process, a world proper to the organism.“ (Varela 1991:79)

As a visible expression of this dialectical linkage (or "coupling"), organisms are contained within a material border: a cuticle, a skin, a shell etc., which is at the same time a product of the organism and its limit to the exterior. One could nearly say: organisms are *prima facie* an act of constant self-separation from the surroundings.

The world beyond this border is materially identical with the compounds that huddle together behind the fluctuating, and at the same time stable organic boundary. However, because the exterior has no importance for the autopoietic process, it is

also different from the matter flowing through it. The organism defines what is outside and what is inside by its self-realization. The distinction thus is pragmatic and not fundamental; it is taken relatively to the system and thus subjectively from its perspective. At the same time though, the distinction is an absolute one: when the autopoietic process stops, the system immediately disintegrates to ‘pure outside’.

This dependent independence is a decisive trait of the living. If the process of life is already a dialectical, not substantial, but rather relational affair, then this is the case far more prominently for the resulting phenomenology, which is brought forth by the living: Inside and outside are not *really* separated, *only* in relation to the process of self-establishment. Subject and object are not ‘really’ separated but become so only in the process of constitution of a subject *vis-à-vis* to its substrate. It is interesting that this insight reminds of the understanding of quantum mechanics, where in certain experiments subject and object cannot be separated entirely from one another and thus must be identical in a deeper sense.

4. Emergent levels of “Self”

The horizon against which this existential-semiotic activity is brought forth, only in simple unicellular beings is the autopoiesis of the *cell*. In other cases, self-referentiality appears on rather different emergent levels of self, which are linked via the circular closures that higher organisms have developed as a means of self-reassurance. But in principle the basic relation, a fragile embodied closure keeping up against *and* by means of a material substrate, is the same even on more complicated levels of biological selves. Hence, Varela distinguishes

„1) a minimal or cellular unity, 2) a bodily self in its immunologic foundations, 3) a cognitive perceptuo-motor self associated to animal behaviour, 4) a socio-linguistic ‘I’ of subjectivity, and 5) the collective social multi-individual totality. In all these regions we are dealing with levels and processes where an identity comes about—not as substance, but as movement—and whose fabric of organisation *is* the organism.“ (Varela 1991:80)

In the quotation, points (4) and (5) are more complicated and not related only to autopoiesis (I discuss this fact extensively in Weber, 2002b). Cultural or social semioses might mirror their organic deep layer in a semiotically quite refined form. This is the standpoint of Hans Jonas. He has developed a proto-autopoietic view of metabolism as paradigm of the existential situation every living being is embedded in. Jonas argues that even the paradoxes of human existence, which oscillates between autonomy and necessity, stem from the making up of organic identity by metabolism. (Jonas uses a slightly different terminology, see Weber 2002a). It might be possible that human ways of world making can (or even should) be traced back to a general organic layout.

What is necessary as a horizon for providing semioses, or, as Varela would have it, for achieving genuine cognition, is an embodied process of creating an identity, a process, which is not instructed by external means, and which is thus always open to failure:

„In defining what it is as a unity, in the very same movement it defines what remains exterior to it, that is to say, its surrounding environment. A closer examination also makes it evident that this exteriorisation can only be understood, so to speak, from the „inside“: the autopoietic unity *creates a perspective* from which the exterior is one, which cannot be confused with the physical surroundings as they appear to us as observers [...]“ (Varela 1991:85).

This definition obviously does not apply to artificial life so far conceived, even if the computational paradigm has given way to the self-organisational view (Brooks 2001). A better way to create life would rather consist in developing a system that as a foremost goal seeks to maintain its own continuity (which might be a dangerous experiment). Self is brought forth only as a closure on and against an influence from a world without that is defined only by this closure—a highly circular process that at the same moment specifies the agent *and* the surrounding world.

The idea of a process of identity also has advantages over the common view, which explains organic identity by genetic similarity. Rather, it has become clear that functioning bodies, i.e. “existential units” can in no way be defined by genetic homogeneity, which has so much come into focus by actual work. Genes may be sequenced, but they do not account for the completeness of a whole organism:

„Identity is not an object; it is a process with addresses for all the different directions and dimensions in which it moves, and so it cannot so easily be fixed with a single number“ (Margulis und Guerrero 1991:50).

There are several points accounting for that. One is concerning the loss of parts of the genome during ontogenesis. Another, more important, deals with the phenomenon of symbionts living as a part of the bodies of most metazoan organisms. This factual inter-species heterogeneity appears as a serious problem for every essentialist theory of biological identity:

„Man appears as a complex to whose harmonious well-being many bacteria, for instance, are absolutely essential. Intestinal flora are needed for metabolism, and many kinds of bacteria living in the mucous membranes are required for the normal functioning of those membranes.“ (Fleck 1979 [1935]: 59-60)

It is of central importance for metazoans, that their cells have to communicate about how to make up the higher unity they are a part of. Most organisms consist of billions of individual cellular bodies and even of other, symbiotic organisms that finally make up the being we perceive as unity:

„The constituents are closely interdependent and on their own are usually not viable. All symbioses, for instance between nitrogen fixing bacteria and beans, between mycorrhiza and certain forest trees, between animals and photogenic bacteria, and between some wood beetles and fungi, form ‘harmonious life units’, as do animals, such as the ant colony and ecological units such as a forest. A whole scale of complexes exist, which, depending on the purpose of the investigation, are regarded as biological individuals. For some investigations the cell is considered the individual, for others it is the syncytium, for still others a symbiosis or lately even an ecological complex.“ (Löwy 1991:43)

Symbiosis obviously is a much deeper biological regularity than long has been thought. Without it, probably no multicellular organism would exist: already the higher (eukaryotic) cells probably arose by fusion of different bacterial cells. Every organism is vitally dependent on its symbionts and vice versa, without their mutual interaction both would perish. Obviously, the symbionts change their host in such a way that it can only exist as such *if changed*: The clear separation of host and symbiont holds no longer true. As observe Chernyak & Tauber (1991:129):

„From this perspective, the concept of individuality does not coincide with genetic homogeneity. Thus, when various strategies are reviewed, the biological lesson concerning homogenous individuals is that *individuality* may not be defined as genetic ‘sameness’“.

Only by taking a functional criterion into account, as is the establishment of the self by a process of identity, we can avoid substantial notions in defining what an organism is. To speak of a process of identity, however, inevitably introduces the semiotic standpoint.

5. Self-constructing the semiotic perspective

The autonomous construction of reality, done by a living agent, Varela calls cognition (using a terminology in the tradition of Biological Constructivism). In cognition, organisms bring forth a world: they create relevance by separating the outside from their selves and at the same time remaining dependent on the outside as a source for existence. Cognition in Varela’s sense is already a semiotic concept. In his term “surplus of significance” (see also below) Varela is providing a semiotic theory *in nuce*. Significance, or meaning, associate with the act of continued existence, and spring forth as a basic feature of a living being’s world making:

„In brief, the term cognitive has two constitutive dimensions: first its coupling dimension, that is, a link with its environment allowing for its continuity as individual entity; second its *interpretative dimensions*, that is, the surplus of significance a physical interaction acquires due to the perspective provided by the global action of the organism.“ (Varela 1997:81, emphasis by me, A.W.)

In his 1991 paper, Varela even uses the expression „imaginary dimension“, a keen term, but maybe better characterizing that what we could understand by ‘surplus’, as we will see now. The changeover from the material level to the level of significance happens by the same movement by which the organism manifests as a global process, in other words, when there is life. For an organism, any relation of energetic trade with the milieu becomes a relation of signification on the existential setting of the organism. The formation of the self creates the surrounding world on the background of this exchange process. In the act of self-assurance self and foreign are (pragmatically) defined. Because what has been exteriorised by the system as foreign is still vitally important for the it (as food, shelter, even mate), the system’s domain of relevance is created. The relevant world is the system’s *Umwelt* established by this process:

„It is *ex-hypothesis* evident that an autopoietic system depends on its physico-chemical milieu for its conservation as a separate entity, otherwise it would dissolve back into it. Whence the intriguing paradoxality proper to an autonomous identity: the living system must distinguish itself from its environment, while *at the same time* maintaining its coupling; this linkage cannot be detached since it is against this very environment from which the organism arises, comes forth“ (Varela 1991:85)

The dialectic involved here is a quite fundamental one: Only by self-definition, the world as the domain of relevance is established, and only in the separation from this world, the self supplies signification. By confrontation with the world, which it has excluded actively, the subject generates meaning. Thus the

„cognitive activity is paradoxical at its very root. On the one hand, the action that brings forth a world is an attempt to re-establish a coupling with an environment, which defines the internal coherence through encounters and perturbations. However, such actions, at the same time, demarcate and separate the system from that environment, giving rise to a distinct world.“ (Varela 1997:80)

Autopoiesis thus differs from other self-organizing concepts in that it is on one hand close to strictly empirical grounds, yet on the other hand provides the decisive entry point into the origin of individuality and identity, connecting it hence with the semiotic realm.

Varela understands the organism as a relation between compounds and the process creating these compounds, and thus as a relation between a self and an *Umwelt* together with this self. This latter relation is in a strong sense existential, because it belongs to the network of processes by which the organism distinguishes itself from matter; it is literally deciding about prosperity or failure, about life or death. This existentiality branches out into the finest filiations of possible relations to the world. And it is the organism's paradoxical dependence on its surrounding that lends to that surrounding an unchangeable existential meaning. On this foundation, a semiotics of the living world can be constructed. Its shape would be a biological theory of meaningful natural signs *qua* the organisation of the living that is realizing its existence.

6. Need, value and meaning

Meaning arises as a kind of ontological foil for the material auto-production, which an organism is concerned with *ad infinitum*. Therefore, subjectivity is not only found in human intentionality. It is rather at the ground of any behaviour emerging from the autopoietic outset. Subjectivity is the expression of the fact that a living system is concerned with itself. *Because* life is continued existence against the weight of matter, life is already intentional at its very beginnings, and there is a subject perspective in every living system. This subjective perspective is the standpoint of concern: a living system tries to keep up itself against external influences, or, as we could say in autopoietic terms, perturbations. Already basic forms of life, therefore, adopt a subjective perspective as a result of their existential need.

Life is a fragile, precarious principle. Life is not an unlimited success-story, because it is a process happening on substantial matter. The self-making self has to survive in a world characterised by an "other". In the antinomy of form and matter, which lies in the metabolic principle of life itself, this other-reference becomes a first order phenomenon. The rudimentary cognitive subject is the *interpretant* necessary to make up a biosemiotic entity:

„The difference between environment and world is the surplus of *signification* which haunts the understanding of living and of cognition, and which is at the root of how the self becomes one... There is no food significance in sucrose except when a bacterium swims up gradient and its metabolism uses the molecule in a way that allows its identity to continue. This surplus is obviously not indifferent to the regularities and texture (i.e. the "laws") that operate in the environment, that sucrose can create a gradient and traverse a cell membrane, and so on. On the contrary, the system's world is build *on* these regularities, which is what assures that it can maintain its coupling at all times.“ (Varela 1991:86)

Only the presence of a living being provides the objects in the world with their sense. It does so by transforming them to the stage set of an existential drama. Only by this existential sense, objects gain their significant role. Their presence or absence for the organism decides about prosperity or defeat, stability or chaos. This happens precisely because the organisms has to “master things“, because they are so detached from its autonomy that they only *mean* something to him and do not *cause* a behaviour directly. As Varela observes:

„Whatever is encountered must be valued one way or another—like, dislike, ignore—and acted on some way or another—attraction, rejection, neutrality. This basic assessment is inseparable from the way in which the coupling event encounters a functioning perceptual-motor unit, and it gives rise to an *intention* (I am tempted to say „desire“), that unique quality of living cognition“ (Varela 1991:97).

The subjective world of existential meanings arises in the same movement by which the organism is creating itself. It is thus necessarily coupled to such an auto-creation and cannot be separated from it. Rather, when organisms are conceived of as autopoietic systems, *meaning* is one of their fundamental dimensions of existence—it is the true marking point that distinguishes the organic realm from matter.

The existential dependence that is the consequence of the special mode of being of the organism is a motor of meaning *ex negativo*. The endless swelling of the imaginative realm, of the domain of options and of creation is the other face of lack that the living every time has to cope with to go on (for a inspired discussion of the ontology of genuine creation cf. Steiner 2001). It is therefore not so badly exaggerated when Varela (1991) speaks of an “imaginary dimension” of the living: the answer to the dependence is the unfolding of a dimension of meaning. In all its creativity the living uncouples from the crude existential situation, and nonetheless always keeps related to it. This relation is a play with the constraints in an endless morphological, esthetical and maybe, moral variation. The perspective of a threatened and thus affirmation-dependent organism lays a new grid over the world: a ubiquitous scale of value. Everything the living being is interacting with, gains its own value in the pragmatics of this interaction. Its relevance is related to the amount in which it allows the continuity of existence. For an organism the world is at no a time neutral place.

The entire colourful ontological universe we know arises from this perspective. It can only unfold in a fragile being that is all the time threatened by its destruction and thus invents, or enacts, ever higher levels of integration. The world without living agents would be a completely neutral place. Only after life has come into it, the world becomes real in prospering and pain, joy and misery. Only the living is interested in its life as continuity. By this interest it introduces an absolute value into the indifferent matter. This *absolute meaning* is the only reliable constant in an organism’s life.

Things are not neutral in them, but already marked by good or bad. In the first beginning, they have no names except the existential notion of help- or harmful. Therefore, we could say with Jonas (1973) that *feeling* is the first unfolding of the world, and maybe we find an emotive background as the deepest underlying structure in all concepts of reality (Weber 2002a). The first fission of the world, the first discontinuity in the homogenous equilibrium of eternity has no structure, it is nothing but the amorphous cry of highest urgency uttered by the organism: vital or deadly.

This point provides strong affinities to two adjacent discourses. On the one hand, from a biological perspective, Kull (2000) has highlighted that ontologically we can understand the living, as opposed to functional artefacts, as displaying “need”. From a phenomenological perspective, Barbaras (1999) has proposed to comprehend the living and its intentional worlds as being grounded in a deep layer, which he calls “desire”. This is the background that *ex-negativo* forces biological beings to invent their perceptive and morphological worlds as a positive movement to evade stagnation viz. destruction.

However, this negative motivation must not necessarily lead to a *negative ontology*. As there is no relevant world *before* the organism, there is no threat to its closure before it is achieved. Desire is the complement to the exterior world, which the organism creates by its auto-affirmation; the lack is overcome or even over-satisfied at the moment of its occurrence. Rich variety and experience immediately fall together with the possibility of their destruction. Before semiosis, only meaningless gradients exist.

7. Intrinsic teleology: perturbations become signs

It is interesting that the complex network of a living being is able to quit the linearity of cause and effect. Its properties as a network, which are empirically observable, stand in a clear opposition to the attempt of reducing biological processes to a linear genetic causal principle. Genes thus can be viewed as one part of a larger regulatory context. A system, which is not *reacting* directly to an input, but *acting* according to its inner disposition, is not strictly bound to mechanical causality. However, this autonomy is not achieved by the introduction of new “vitalist” laws of life, but by the emergent regime that the interacting compounds produce. Thereby the outer world becomes a parameter in the complex self-regulation. The immune system may be a good example on the level of a functional. Also Varela (1991) devotes detailed work on it (see also Varela & Anspach 1991).

Important philosophical problems, explicitly those of free will, exist only if the organism is viewed in terms of a deterministic machine and not as an autonomous system. The Varela school is emphasizing that the external world acts as a mere ‘kick’, which motivates the system to establish a new equilibrium characterised only

by the necessities of self-support. For a biosemiotic approach this means that it is not longer concerned with the constraints of the mind-body-problem. Dualism becomes obsolete by the material circularity of autopoiesis. In a self-referential system, meaning is the “inner” side of the material aspect of the system’s closure. Dualism thus is swapped with a semiotic standpoint. Consequently, a biosemiotic account must show the transition of meaning from its material origin to its subjective meaning in organism. On a more phylogenetic basis, it is concerned with the evolution of sign-processes from a general organic level to a human or cultural level (for some ideas on this see Weber 2001a, 2002b).

At this point new light is shed on the closeness of the concept of semiosis to the idea of teleology. As we have seen in chapter 2, autopoiesis promotes a realist reading of “internal” teleology: why can organisms function purposefully? What is not touched by it is the notion of “external” teleology, the question, if the biological world is a product of purposeful design, which occupied physicotheology and motivated Darwin’s thinking in the beginnings (See Weber & Varela (2002) for a detailed argument in favour of a reconsideration of teleology as a founding condition of the living.)

To restate it briefly: An autopoietic description amounts to a realist reading of intrinsic teleology and at the same time can be expressed in semiotic terms. Already Peirce saw this close relation of teleology and semiotics, as Deely (1990:84) observes: „To Peirce, the fact that a sign always signifies something to or for another suggested the need to reconsider the taboo notion of final causality, or so-called teleology“. The making of the self actually creates a triadic situation: by (1) self-confirmation, the (2) non-self as *Umwelt* is separated, and this separation now opens (3) the option for interactions with the *Umwelt* in the better or worse. On one hand, this triadic relation can be understood as the archetype for a sign-process in the sense of Peirce. On the other, it is the way along which real world making takes place in organism. Living beings are embodied teleological processes. Intrinsic teleology calls for the description of organisms as subjects. Intrinsic teleology can be described in semiotic terms.

Hence, in biology, we have already an embodied paradigm for semiotic interactions. Sense making is a real, existential activity of organisms: Still more, it is of existential importance and even can be defined as the basic character of organisms. Life means to make sense. Self-constitution of a subject *always* is the constitution of a semiosphere. This is the necessary condition to write a biological semiotics as a foundation for a general semiotics.

Peirce’s triadic sign has another trait, which we can find in Maturana’s and Varela’s (1987:179ff) reasoning. They have created the term “perturbation” as a description of the system’s coupling to the surrounding world. A perturbation is a (indifferent) stimulus that is interpreted by the living being according to its inner structure. A perturbation becomes a sign through its meaning for the ongoing existence of the

organism. From an internal perspective, every perturbation is experienced as a sign. Only the sign exists really (in an energetic sense). However, it is but perceived in that form which our body makes of the perturbation it causes. Conversely, the interpretant is real only in so far the sign has a meaning for him.

The object (in our case: the signification) does not ‘really’ exist as such, but only arises as it is touched by energetic-material influences of the surrounding world. Such a conception again bears similarities to Kant’s *Ding an sich*, which can never occur in its “real” nature because we are slaves to our conditions of perception. When we see this closeness of Kant to a semiotic interpretation, we can understand why Peirce as well as Uexküll felt they would continue the Königsberg philosopher’s argument.

In a pragmatic sense, the only reality is signification: it springs from an existential need and thus becomes the elementary grid of experience. Experienced meaning thus is the only trace of an underlying, complicated ontology. In the organism’s perspective, nothing remains except from this signification. The existential condition is meaning, and while being existential, it hides its ontological foundation and thus becomes the proverbial blind spot on the organism’s standpoint.

8. The living world: co-specification and interbeing

As we have seen, Varela embeds his theorizing in a general model of organic cognition, i.e. in a theory about construction of meaningful phenomenal worlds. His later work therefore shows a strong occupation with the question how the closed semiotic universe of an organic agent can be compatible with the notion that there is always an *Umwelt*, and a surrounding world of other agents with whom the living subject interacts with. To understand this, Varela construes the hypothesis of “reciprocal specification” (Varela et al. 1991). This is partly inspired by research in psychological categorization (Rosch 1978). On the other hand, it is to some extent similar to the position held by the most prominent representative of embodied phenomenology, Merleau-Ponty (1966).

By stressing the common genesis of phenomenal world and subjective standpoint in perception, Varela tries to overcome the danger of solipsism which every strong constructivist, and to some extent also a biosemiotic position is liable to be subject to (see above). Against this danger, the mutual creation of world and living agent provides the key for understanding why organisms so remarkably fit into their environment, and why communication within it is possible. Here I will limit myself to draw a brief outline of Varela’s position and then show, in discussing Merleau-Ponty, some implications which lead, in a backward loop, directly into a semiotic understanding.

On an embodied level, the process of perception is not so different from the fundamental self-limitation of organism, which generates non-self from the

encounter with the exterior that has to be excluded from the autopoietic process. This is also valid for perception: The exterior becomes a decisive component in the construction of the percept, and, *vice versa*, the perceiving structure marks decisively the creation of the perceived world. What results is a communion of perceiver and perceived. Here, the presence of the other is reality, not fiction, even though only the process of perception is responsible for its ultimate shape.

From the enactive standpoint, the external world's influence is even augmented by a kind of absoluteness of the objective outside: The real presence of a material perturbation is necessary to engender any perception. Varela et al. (1991 [1995]) try to explain this by analysing the human colour system that seems to be marked by culture *and* by neural structures alike:

“Contrary to the objectivist view, color categories are experiential; contrary to the subjectivist view, color categories belong to our shared biological and cultural world. Thus color as a case study enables us to appreciate the obvious point that chicken and egg, world and perceiver, specify each other.” (Varela et al. 1991:172)

This stance is already prepared in Merleau-Ponty. His philosophy is to some extent a semiotic foundation of phenomenology, because the *living body* is arbiter about how the world is perceived (see e.g. Merleau-Ponty 1966:478). This narrow relationship with the biological bases of perception has even lead to the assumption that Merleau-Ponty's work is no phenomenology at all (cf. Latour 1995). Phenomenology, as Husserl construed it, had a strong mentalist tendency in its attempt to recreate the world from pure intentionality. The discipline has nonetheless sparked a field of thought that can be classified as “biological” or “embodiment-” philosophy. From a biosemiotic standpoint, I believe, we can reformulate its general position, where Merleau-Ponty can be added, into the following idea: The living body in its existential concern is the interpretant of the Umwelt's signs. As Merleau-Ponty observes:

„A thing is, therefore, not actually *given* in perception, it is internally taken up by us, reconstituted and experienced by us in so far as it is bound up with a world, the basic structures of which we carry with us, and of which it is merely one of many possible concrete forms“. (Merleau-Ponty 1962: 377).

In this view we can see, that an interrelation of phenomenal worlds, which are all bound to the common constraints of biological cognition, or semioses, show the way to a general *conditio vitae* living beings are unified in (Weber 2001a, 2002b). Beyond the fact of supplying the universal framework for biological sense making, the “event space” of the *conditio vitae* is a materially, historically, and semiotically multidimensional conglomerate where signs ever spark new signs, and which is formed by a more or less intense interdependency of its agents.

This idea, although in a markedly different accent, reminds of the concepts of “hybrids”, coined by Latour (1995), a term unifying material entities, cultural customs, and living beings to explain the true characters of the objects of science. It is most interesting, that also Varela has seen this relationship, and even, together with psychoanalyst Amy Cohen, devoted a paper to it (Cohen & Varela 2000). This axis of understanding cannot be underestimated. Latour has observed that scientific constructs are never free of a social bias, but he equally emphasises that they are always full of residues of real bodies. If we consider the hybrid status of Varela’s enactivist account (which we have tried to interpret in a biosemiotic fashion), we might have found in his biosemiotic philosophy of cognition, another answer why human world making, be it scientific or explicitly pre-modern, is always an intricate network of bodies and significations. Varela might have supplied the biological grounds to understand our worlds’ “surplus of meaning”.

9. Shifting paradigms: Biosemiotics as a new episteme for systems biology

Also scientific revolutions might devour their children. In a sense, this seems to be the current scenario in actual genetic research. On the one hand, it is ultimately successful by providing data from genetic sequencing and an ever refined description of genetic regulation (in spring 2001 the coarse sequence of the human genome was published, Baltimore, 2001). On the other hand, modern biology *by this succes* is forced to admit more and more exceptions to the still central dogma of DNA-plasma causal linearity.

This erosion of the very foundations of nucleus-related genetics is due to its own success. Maternal factor, splicing, secondary structure folding, epigenetic regulation (a gene product is feeding back to the genetic apparatus, Keller 2001) are circular rather than linear models of regulation. They display a strong influence of complex plasma reactions, which can change the fate of genetic information (in this sense, already the Jacob-Monod-model showed a first departure from Crick’s ideal hypothesis of genetic expression; see also Gilbert & Sarkar, 2000).

Hence, any major medical breakthroughs, which are thought to come along with a broad sequencing of the genome, probably cannot take place before a basic understanding of the post-genomic-regulations will be achieved. Proteomics seem to become the next field of the game, being one to two orders of magnitude more complicated, though (Weber 2001b, Richard Vilems, pers. communication). Most interestingly, this development seems to bring an approximation of genetics and developmental biology, which traditionally is the biological discipline that is concerned with regulation. This is a historically most intriguing outcome: For five decades, advanced genetics seemed to have won over developmental biology in discovering the comparably simple Watson-Crick-model. This advantage apparently is vanishing. In this situation we are forced to reconsider the prophecy of the US Long Range Planning Committee for scientific organisation. For Biology on the long

run it expected a paradigm shift from linear interactions to the systems' or "organismic domain" (Strohman 1997, Long Range Planning Committee 1990).

As Emmeche and Hoffmeyer (1991) and before them Blumenberg (1981) have seen already some time ago, neo-Darwinian biology is at odds with giving up a speech that is frankly contradictory for its theoretical framework. By talking of code and message, it contaminates its own theoretical agenda with semiotic terms (a critique which is equally valid for the ever-present teleological arguing in Neodarwinism—the two possibly being strongly linked, Weber 2001, Weber & Varela 2002, and see above).

In this context, it is most interesting that also the modern synthesis of Evolutionary Theory speaks of certain autonomy of the living. Ernst Mayr (1988) even uses the term "vitalism": For him a distinguishing character of organism does exist because the latter is constructed of genetic information. This is certainly a challenge for the autopoietic model, which works without taking genes much into account. Varela stresses autonomy explicitly without recurring to the metaphor of autonomous genetic information. For him self-regulation is primordial. But is not the enigmatic autonomy provided exactly by the genetic program that directs the organism's metabolism (as Schrödinger, though somewhat contradictory, has proposed 1944?) Can organic autonomy be equalled with genetic instruction? Thus, do the genes have an ontological priority?

As is visible in the new problems that arise for genetics, such a view far too easily overlooks the importance of the living body for all biological functioning. The genes, although obviously an abstract code, do not exist in an abstract manner, but are embedded in the functioning of the organism. They are part of this vast circularity: e.g., they are repaired by somatic components, which have been encoded by the units they are repairing. There is no exception of the law that in an organism everything is reciprocally working as medium and final goal. Here, the biosemiotic concept of "genetic scaffolding" provided by Hoffmeyer and his broader view of biosemiotic code duality (Hoffmeyer 1997), supply a framework for solving contradictions. The crucial point is to have the right philosophy of organism at hand to overcome the intricacies of genetics. In the new shift to systems biology we can not only witness closeness to developmental biology, we also can see a rediscovery of a certain angle of view which is focusing on the minimal living organism as the ultimate object of a *bio-logic*. For a long time this has been the main issue of the organicist school of biology, the paradigm, which was competing with Neo-Darwinism. Now, in the guise of complexity biology as represented by Kauffman (1996), Salthe (1993), Weber & Depew (1996), and Varela, it might offer new competing solutions to the overwhelming challenges of systems biology.

Varela's work might serve as a possible bridge between theoretical biology, organicism, phenomenology and biosemiotics proper. His influential position in cognitive science might facilitate the translation and homogenisation of semiotic

concepts, which could lead to a closer acceptance, or “naturalization” of the semiotic argument. In this respect, Varela’s “imaginary dimension”, has to be considered as a basic aspect of the realization of the living, and at the same time, as a door opened to the human sciences. Varela’s work is deeply engaged in cutting down the separation between the two realms, between the human sphere and the remainder of the material world. Based on his work, by exploiting the potential of existential value-genesis as well as the expressive, or performative, aspect of every living being’s uttering, a comprehensive cultural-biological semiotics might not be impossible (Weber 2001, 2002b)⁴.

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