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Explaining and understanding LIFE

The biosemiotic model and some suggestions in the light of pragmatics of language

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Jesper Hoffmeyer shows us the direction of one of the next fundamental changes of paradigms in the history of science. In his intention to explain life processes in the light of semiotics he has gone beyond established biological mainstreams. He recognized, that models of explanation, wanting to explain the organisational structures of all living phenomena by the use of a physicalistic language, are not able to reach their goal of complete description of life processes.

The paradigmatic change in the perspective of life processes is: Jesper Hoffmeyer contends that it is the sign and not the molecule that is the basic unit of life. His intention to interpret life processes in the light of semiotics is an exciting trip through nearly unexplored fields of research. Only biosemiotics has recognized the direction, and one of its most modern exponents has focused his intentions and results of research in this book. Beside his excellent model, which opens a new paradigmatic perspective of research consciousness in explaining life processes in future, Hoffmeyer opens a number of new perspectives on traditional problems of research of life-research: the evolution of life(I), the concept of code-duality, which may equalize the split between neo-darwinistic theory of evolution and "neo- lamarkism" (evolutionary DNS-growth by chance versus constructive DNS-growth) (II), the evolution of mind (III), and evolution of language (IV) and a lot of creative explanation details, I will not mention here in detail.

"Signs of Meaning in the Universe" is not a scientific work in the strict sense, but a scientific essay. This may be an advantage, because the step by step-approach is not very successful in steping beyond paradigmatic horizons. But the essayistic style has the disadvantage, that there are a number of propositions which are not substantiated for a consistent argumentation in the scientific discours:

Hoffmeyer uses a number of misunderstandable anthropomorphisms (I), which bring the whole explanation model near methods, which explain non-human nature under the pattern of explaining the human nature. One of Hoffmeyers central terms is "Communication". But his use of "communication" is sometimes too general (II). "Communication" here may be unterstood by the systems theoreticist in his version and by the philosopher of pragmatics of communication in his version, both positions being completely incompatible.

Sometimes he takes the position of systems theory, which produces deficits in the complete explanation of human communication (III), and sometimes he uses semiotical patterns of explanation which reproduce the same deficits.

Therefore my review shall support Hoffmeyers excellent model in a critical way. In the first section I will speak about some implications of Hoffmeyers concept under the aspect of the theory of science. In the second section I will speak about examples of the real life-world (Lebenswelt), the inter- and the intraorganismic communication processes and the constitution of meaning.

The intention is to open one of the most interesting paradigms in the history of science far more: The understanding of life which is followed by the fundamental (self)understanding of us as human beings. Then we will be able to recognize the wonder of life in whole, also to protect it in a very efficient way.

Why anthropomorphisms?

If someone does not take the position that the signuser is subject/object of research it is possible to inquire sign using processes as a behavior of sign using individuals. If someone takes his point of view in the light of linguistic behaviorism, then there is no great difference between the sign using of for example plants, animals oder human beings. Linguistic behaviorism as method of explaning specific different situations of interactingwithin communicative actions remains deficiently. Linguistic behaviorism combines "the symbolically mediated behavioral reaction of the stimulated individual organism" (Habermas 1979: 6)with the model of information transmission ("encoding and decoding signals between sender and receiver for a given channel and at least - partially - common store of Signs", Habermas 1979: 6) The intersubjectivity of meanings, that are identical for at least two speakers does not even become a problem in linguistic behaviorism, because intersubjectivity is in this case reduced to extensionally equivalent classes of behavioral properties.

If we speak about recognizing, responding, reminding, speaking, we know as subjects what the meaning of these descriptions are. We are able to decide this understanding from observations of non human organisms, which we try to interpret as similar behavior. I think it would make sense, if we spoke about semiotic processes in non-human contexts and set quotation marks on terms like recognition, responding, reminding, speaking, etc. This is not only a problem in this book. Also J.D. Watson does not distinguish this terms and is under suspicion of using anthropomorphism: the scientifically inadmissible transformation of human characteristis on non-human living beings.*

What means "Communication"?

One of the most important terms in the book of Hoffmeyer is "communication". Communication happens on every level, between cells, between organisms, but where is the difference between communication of cells, apes oder human beings? I can´t find a clear distinction between different forms of communication. It´s only clear, that all forms are semioses and there are

references to classical linguistical and linguistic-semiotically points of view as well as such of systems theory.

These positions concentrate their efforts on syntactic-semantic analyses,which are not able to analyse pragmatic interaction processes, because they use categories, which are very near on classical metaphysical or ontological positions. Exactly these positions are not able to take the most important conditions for recognizing communicative processes in their concept, or like Habermas says " because they start from the model of the isolated, purposive-rational actor and thereby fail - as do, for example, Grice and Lewis - to reconstruct in an appropriate way the specific moment of mutuality in the understanding of identical meanings or in the aknowledgment of intersubjective validity claims" (Habermas 1979: 8).

On page 46 Hoffmeyer argues "But in general there is no way of telling what the purpose is of all the communication taking place on our planet". In the light of the results of universal-pragmatic communication theory this is not so correct. Living organisms of all organismic kingdoms are not monads, but live in communities, where communication processes are the only possible way to coordinate behavior and organize the life of communities.We must keep in mind, that every possible sign user or interpreter, who is involved in sign-mediated interactions does not represent a monadologic, isolated individual. All of them are members of a species-specific life-world, that share an evolutionary heritage and whose behavior is subject to a commonly shared repertoire of rules.This is the purpose of most communication processes, so that one can say, without communication processes we lack the essential prerequisites for life or continued survival.

What means "system"

Hoffmeyer says, that his use of the term "system" is different from the use "system" in the cybernetical systems theory, because their closed systems and algorithmic decision making processes are not able to explain principally open interaction processes like they happen in semioses between living beings. What means "system" then?

a) System as an ontological term ?

"System" in Hoffmeyers use could also be named "entity", which is a quasi-metaphysical description of state. Also it is not clear whether "system" is equal to a hypostasized term of reality, (a depicture of perceived reality) or is it a term within a model of explanation? In the first case, there will be a problem: To explain the conditions of language with (quasi)-metaphysical terms leads into a paradox situation, because it would have to be possible to explain premetaphysical conditions of successful unterstanding (gelingende Verständigung) with metaphysical terms. Why does Hofmeyer not resign on the term "system" and concentrate himself on the description of pragmatic interaction und interaction-rules between species-specific individuals in his concept of code-duality?

b) System in the sense of the cybernetic systems theory?

In some sentences Hoffmeyer uses "system" in the sense of the cybernetic systems theory. His position there is similar to Manfred Eigen (Manfred Eigen 1975) if the point is the function of the system and the inner logic of this function:

"The point is, though, that in both cases we are dealing with processes, that are organized according to a form of logic which reflects the system´s (the cell´s or the brain´s) evolved semiotic function. (...) What we are looking for is some insight into the practical principles of how the cell or the brain works, i.e. the system´s inner logic, which is, we have seen, an evolutionary product shaped in accordance with the conditions set by statutes at the semiotic level." (Hoffmeyer 1997: 80)

As opposed to traditional systems theory (closed systems as realisations of algorithms), in which "natural laws" regulate the explications of an implicit logical order of the nature, in Hoffmeyers concept they are semioses. Language depicts this logical order through the logical structure of the systems (the brain`s) communication. Is it like Hoffmeyer suggests ("system´s inner logic"), then the most important characteristic of this inner logic is the Syntax. Syntax is the logical depicture of the material reality. Meaning as a semantic aspect comes to this depicture intensiones of material realty through their special combination in various "umwelten". The semantic aspect of language is constitued first through a combined sign- sequence which evolved by chance. This sign - sequence gets meaningness through specific selection processes (the "not"-concept).

Successful explanation of the performative character of speechacts, the aspect of relation and not the aspect of transforming information, between sign using individuals is not possible with syntax and semantics. This is the deficit of systems theories and of linguistics and semiotics to. Communicative competence is the ability, to be able to use a number of rules, which are necessary for generating interactive relations between communication partners. This is different to linguistic competence, which is the ability to use a number of rules necessary to generate linguistic expressions.

Languages of science which depict their systems inner logic (formalizable languages) are incompatible with everyday communication processes .

These explanation models based on syntax and semantics as depictures of the inner logic of material reality are not able to describe the full range of signmediated interactions. On the ground of all formalizable languages and artificial languages of science there is communicative practice which is historically grown. In this practice someone can speake about something and change easely between the level of scientific discourse and the level of speaking about this level of scientific discourse, which would be impossible in using a formalizable scientific language. In everyday communicative practice someone can generate interactional processes which are principally not formalizable, for example in communication processes which are characterised by rulechanging creativity.

I get the impression that Hoffmeyer sometimes equalizes formalized scientific languages with the language used to describe observations. Previous attempts to specify all the rules governing the translation of every term in theory-language into terms of observational languages have been unsuccessful.

The "not"-concept

Hoffmeyer tries to explain the generation of meaning in a process of interaction as a systematically narrowing down the probability distribution of semantic alternatives until only a

single alternative remains. Narrowing a probability distribution down in this manner can be achieved physically only through irreversible processes. This would be a kind of evaluation of meaning (a selection process). To generate a "something" one has to eliminate all meanings which are "not"-this something. If I think about coffee, so the "not"-concept is clear and distinct because it is not a tree, not a car and not a kindergarden. "So the "not" rule is the very first requirement for making sense of this world."(Hoffmeyer 1997: 9)

Also this concept Shannon has developed and quantified. Also Popper´s criteria of falsification follows this pattern: In generating theories all possible alternatives were falsified, except for one. Popper´s falsification criteria is able to establish an evaluation-of- meaning-scheme for quantifying theories. This classical method of deduction is successful for the generation of quantifying theories. But we are not allowed to mix up 2 different levels: The one is a criteria of theory of science (developed to substitute the not very successful verification criteria of the logical empirism and to find a method of evaluation for generating scientific theories rich in meaning) about the quality of quantifying theories. The other should explain how meaning in semioses arises.

So we have a discussable or by itself fallible model of evaluation in the light of theory of science and not the reality of understanding some information with which the brain recognizes it´s own form of organization and the inner logic of this form. The "not-"concept tends to interprete the reality of constituting meaning as expression of the logic of a material reality. This is again the point of depicture theory of cybernetical systems theory. It reproduces the deficit, that it is not possible to explain the pragmatical situation of relation processes by syntactic-semantical rules. Also for the constitution of meaning most important are the situations of real interaction between sign using individuals. Surely, the syntactic competence is necessary to build a common shared number of signs. The rules for functioning everyday communication are learned by sign users in actual relation processes, which follow pragmatic rules of every possible understanding or as Hoffmeyer says with Wittgenstein: The meaning of a word is its use. Therefore the "not" concept is less helpful as model of explanation of the generation of meaning, because it is a quantifying model for explaining the quality of sign using contexts. To understand an utterance someone has to be involved in an interaction process of a social body, not to know the quantity of the used signs.

To empathize?

A further problem is the model of en- and decoding in linguistics and semiotics, which is used by Hoffmeyer. "Speech demands both a coding mechanism (in the speaker) and a decoding mechanism in the listener." (Hoffmeyer 1997:107) This model functions between strictly isolated individuals: "In messages between communication partners, one side encodes the news he/she wishes to convey in phonetic characters; the receiver must then decode and interpret the message based on private personal experience. Understanding messages shared between transmitter and receiver is principally possible since a uniform logical form- a universal syntax - lies hidden behind every language. Messages are therefore apriori intersubjective in form and structure, while the interpretation of content remains a purely private matter." (Witzany 1993 a : 138) Therefore with this concept one can only understand expressions of the partner of communication through empathy which enables the one to "feel" the private background of the other partner.

Also in this model the real process of relationship between interaction partners is lost. Speech acts in this model are actions of monadic actors und not commonly shared, historically grown everyday-practice. Therefore Hoffmeyer gets difficulties in explaining the understanding of meanings. So he takes an older model of explanation in psychology, the model of empathy. "Because it is through empathy that we become human" (Hoffmeyer 1997: 133).

But someone does not understand the expressions of a communicative partner (or sequences of behavior which may be interpreted as expressions) because he has an emotional ability of empathy. Someone understands an expression or a speech act if he/she can follow the same rules which are indispensable for a successful interrelation. Speech is a form of action and actions can be understood, if someone understands the rules the action is followed by. This means, someone can understand an action, even if the action runs against the rule. So understanding has much to do with acceptance: We understand a speech act if we know what makes it acceptable. That means, we are able to understand a speech act, even if we don´t accept it (f.e. an imperative speech act).

The practice of speech acts corresponds to the practice of social interactions. Every understanding of expressions presupposes the participation of the understanding individual on a practice of social interaction. This practice of social interaction strengthens the communicative competence to choose the right medium of expression. The use of the right medium of expression is necessary although my partner of social interaction has the possibility to know what I mean with what I say (Vossenkuhl 1982). This is a purely quality evaluation and not a quantity evaluation like it is in the "not"-concept. And the rightness of an utterance is only one of four presuppositions of successful communication where meaning is actually constituted, the others are comprehensibility, truth, truthfulness (Habermas 1985).

If someone uses the model of en- and decoding information units, then he has no other chance than to fill up the syntactic units with private intensions of experiences. The communication partner has more or less the chance of empathy...

The question is why Hoffmeyer uses models of explanation? Why doesn´t he concentrate on the presuppositions of the possibility of formulating models: linguistic and communicative competence. It would be not so difficult to let go these models of explanation and turn to a semiotic interpretation of the interrelation processes of interacting populations and their relevance in the concept of code duality. Then the point of interest is not the inner logic of a system but the presuppositions of successful signmediated rule governed interactions. then the main interest are compatible, principal rules of concrete sign use. The situation of sign use is responsible for the constitution of concrete meaning. This I will demonstrate on two examples*, some inter- and intraorganismic communication processes:

The Apriori of understanding situations (Verständigungssituationen) for constituting meaning in the bee language

The language and communication of the honeybee, which has been studied in great detail, can serve as an example for nun-human language (Frisch 1952, 1953, 1955, 1965, 1971; Lindauer 1975, 1981; Seeley 1982; Heinrich 1981) On the example of two sign-mediated communication processes in the language of northern hemisphere honey bees, I want to demonstrate, how in

certain situations the behavioral context determines the meaning of the linguistic signs used. The bees' ability to interact socially is no doubt genetically fixed. However, the constitution of the specific performance, i.e., of the actual communication process, is contingent on the actual situational demand:

a) In the sign-mediated communication process underlying the foundation of a new colony, only scouts participate in the search for a new home. They are the oldest bees in the swarm and have already gathered food for the parent hive; they are fully experienced with the features of the local terrain. Why do only these experienced scouts swarm out, and not the inexperienced ones as well? Does the flight of the queen cause certain genetic text sequences in the scouts to be expressed, i.e., those that code for and initiate such a behavior? Or does the rule governing the participation of only experienced scouts underlie some other species-specific, intersubjective communication?

The criteria that a prospective hive must fulfil are so differentiated that one can reasonably assume a genetically determined inspection and evaluation behavior. On the other hand, these evaluation criteria clearly do not exist from the onset: they must have been constituted by experience, followed by subsequent genetic fixation. Pragmatic situations formed the evaluation pattern for the combination or creation of genetic sequences that then coded these experiences as text sequences.

No haphazard change or deformation of genetic text sequences can shape the highly differentiated selection criteria for the winter hives of northern hemisphere honey bees: they are simply too rigorous. The failure of the hive selection process to closely match the required hive features can kill off the entire swarm in one winter. The argument that this involves the natural selection of many chance mutations would imply the extinction of all northern hemisphere bee populations before they ever had the opportunity to develop sufficiently differentiated selection criteria for suitable winter hives.

The process by which a potential winter home is scrutinized is itself incredibly complex and exact. The bees pace the entire length and breadth of the new site: no millimeter is left out. This explains why a single bee covers a distance of nearly 50 m in the course of this inspection, even though the cavity itself is relatively small.

This performance by the bee fulfils a reliable evaluatory function and is part of the overall sign-mediated communication process; in this case it represents an individual contribution. Such specific hive inspection behavior must have been constituted as experience and subsequently become genetically fixed. Some "factors" in the cell must have coded the specificity of this experience and inserted it into the correct site in the genome. Otherwise the tree hollow would be unable to trigger the expression of the particular genetic sequence that induces the individual bee - at the very time of its arrival there - to reproduce the genetically fixed experiences of past bee generations.

Even this transformation of the scouts' experience into the text-combining activities of enzyme proteins is insufficient to explain why such genetic text fixation provides the next bee generation with suitable hive-selection criteria. After all, the scouts have a different status than the queen, who gives birth to all bees. While she does move into the new hollow with the swarm, and a

genetic fixation of how she experiences this hollow is conceivable, how can she genetically transmit the inspection procedure when she herself did not participate in the inspection? What plausible path exists between the experience of the scouts and the genetic text of the queen? Can one assume a generative linguistic behavior in which experience is initially conveyed interindividually and only later - genetically combined - incorporated into the genetic make-up? One scenario: the scouts impart their experiences to the queen in the form of sign-mediated communication; she represents these internally as stimulation patterns which function as coding criteria that are inserted into the genome in correct relation to existing text sequences. And what might the criteria that govern the transformation into the genetic text be, i.e., which experiences are genetically fixed and which ones are not?
Pragmatic interactions or communication situations which the overall organism experiences in real life apparently determine how code constituting factors of that organism constitute new or altered genetic text sequences.*
*Is this truely lamarckism? This scenario could be founded on the hypothesis, that beneath the 3 known codes (protein code, regulatory code, structure code)
The sign-mediated communication process underlying the founding of a new bee colony also points to numerous other pragmatic situations that must be or, if they are genetically fixed, must have been vital for the evaluatory function. The consultation between scouts about the potentially most suitable new home - in this case the tail waggle dance - raises the question: what induces bees that have identified a potential site as being less satisfactory to dance less vigorously, and bees that have identified a site as being highly suitable to dance more vigorously and to „symbolically code“ (Todt 1985: 207) the direction and distance of their discovery? What induces the less lively dancers, those who are less convinced of their discovery, to take up the invitation of the more vigorously dancing bees to inspect the site they consider to be particularly suited, especially when this involves repeating the same complex and time-consuming inspection procedure? What subsequently enables these bees to decide in favor of the recommended, inspected, and perhaps more highly evaluated site and to themselves promote this site with an appropriately intense dance? Furthermore, this new decision may itself be temporary, and another, even better home may trigger a renewed inspection process, etc. At any rate, the final decision is a consensus decision by all scouts, all of whom have by then inspected the most highly advocated home. If no consensus can be reached, no decision is taken and the swarm freezes to death at the site of their deliberations during the first cold spell.

Provided that the decision-making process represents sign-mediated communication, then it cannot be of the algorithmic type; rather, it must be a truly communicative process between conspecifics in a commonly shared life world (Lebenswelt). They represent subjects for one another because they use the same linguistic signs in the same sign-mediated communication process to achieve understanding, form associations, and coordinate behavior. The fact that language is involved, i.e., language and not merely a formal procedure, opens the potential for generative and therefore entirely new linguistic behavior. Otherwise, northern hemisphere bees would never have been able to differentiate the necessary sign-mediated communication processes (processes outside the repertoire of southern hemisphere bees). Whereas southern hemisphere bees use behavior to constitute signs with direct indicatory or invitational character, northern hemisphere bees employ movements to constitute and utilize a symbolic sign character for these movements; understanding these signs permits more differentiated messages to be deciphered (messages that even humans can understand, provided that they can determine the rules underlying the use of these movement signs).

D. Todt, a sociobiologist whose research was instrumental in initiating an interdisciplinary dialog with semiotics in Germany, expressly underlines the use of symbols by bees of the northern hemisphere.

The specific sign-mediated communication process involved in searching for a home is terminated only when consensus has been reached. The process is completed when a new home (one selected exclusively by scouts) is inhabited and developed.

b) This marks the onset of the second sign-mediated communication process described above - food gathering. Again, the tail waggle dance is used to convey information. The rules underlying the movement sequences as well as the indication of direction and distance remain the same as in the preceding example. The sequence of signs is also the same. Their meaning, however, is different because they take on new meaning within the pragmatic context of a new communication process. The waggle dance may well be a rule-governed, genetically fixed behavior that is expressed as the need arises: nonetheless, the actual situation in which the signs are used within a population of communicating conspecifics lends meaning to the signs themselves and determines their sequence in a dance.

In addition, the target group addressed by these expressions is not the same as in the preceding case. All foragers, not just the scouts alone, are called upon to search for food sites. One situation-specific feature is responsible for the fact that foragers (and not just scouts) are being addressed, even though the mode of expression and the utilized linguistic signs are the same as in the previous example in which scouts were prompted to swarm out: only when the dancers carry flower pollen - which is not the case when the task involves searching for a new hive - is the call valid for foragers as well. In the absence of pollen, the foragers do not react to the messages or invitations. Understanding between bees is not limited to dance movements alone. These movements are combined with (the very important) vibratory movements (Kirchner/Towne 1994) of the wings and abdomen along with the rule governed use of olfactory signs. This marks the limits of our comprehension of the bee language. Human beings can never hope to progress much beyond a passable understanding of the rules governing the bees' use of language signs: beyond a certain complexity of sign combinations, mastering the specific modes of use would require becoming involved in the bees' communication process as interactional subjects. This inherently transcends human capabilities and points to the limits in the compatibility of transpecific forms of communication, for example in metaorganismic communication (communication processes between members of different species).

c) One final pragmatic criterium for the signifying function of the utilized linguistic signs deserves mention: the occurrence of various bee dialects. The same sign (or the same sign sequence) can exhibit slightly different rules of usage in bee colonies that are geographically widely separated yet belong to the same species. In a special case of the Austrian and Italian bees , the form in which the same symbolic (behavioral) sign is expressed can translate into site deviations of several hundred meters, The pragmatic context, in this case the bee colony's actual life-world (Lebenswelt), determines the semantic rules according to which this sign is interpreted.

No intra- and intercellular linguistic sign without real sign users.
The importance of cellular communities of communication

The genetic code which is fixed in DNA and read, copied, and translated in gene expression gains importance as a genetic text only if real sign-users are available to read, copy and translate it into the amino acid language. This gene expression, along with all of the related subprocesses is neither mechanistic nor mysterious and vitalistic. Rather, it is the result of complex, regulated interactions and highly specific behavior coordination between numerous types of enzyme proteins (Watson 1992).

These enzymes clear the text for reading, implement the copying into the three types of RNA, search the text for superfluous text passages, cut these out, to a certain extent repair damaged sections using rougher and finer techniques (excision- and postreplication repair), and complete the entire process of normal gene expression (Howard-Flanders 1981). All enzymatic protein individuals are themselves coded as genetic sequences, yet enzyme proteins themselves always clear genes for reading and thus ensure the reproduction of all necessary enzyme proteins. This allows numerous generations of specific enzyme protein types to exist within the life-span of an organism, beginning at the onset of life.
The technique employed in the reproduction of the enzyme types is the same in all organisms in which genetic texts must be read, copied, and translated into the amino acid language. Every cell of the entire organism stores the complete genetic construction plan in the form of the genome, although only those text passages required for the function of the particular cell association are expressed. This also means that the specificity of the cell association is decisive for evaluating those passages (within the total genetic text) that are to be read, copied, and translated. Every organ, i.e., every specific cell association in which specifically associated cells must carry out a function for the complete organism (in a complex coordination with other organs), requires regulated interactions in order to fulfil the demands placed on it by the organism (e.g., raised pulse rate after physical exercise).

Today we appreciate how complex the execution of this sign-mediated communication is in specific communication situations and within specific requirement profiles (Witzany 1993 a). The communication between cells of a cell association (organ) is irrevocably limited to this context, i.e., the irreversibility is genetically fixed and virtually guarantees abidance by the rules that govern the reproduction of cell-association-specific progeny: we can be certain that liver cells reproduce only new liver cells.

At the same time, the specific position within a cell association determines the expression of those genes which code for the (punctual) reproduction of a cell in *precisely this specific* position. *The actual position of a cell in the real environment is the evaluation criterium for the gene-expressing enzyme* to express exactly that segment of the total genetic text which enables the reproduction of a cell in that and no other position (Gehring 1985).

Highly specific cell communication between cells of a cell association further enables the production of proteins required for the various functions (e.g., metabolism function) within the complete organism. The required proteins are not infrequently produced by very different cell associations via very cell-association-specific communication processes (Witzany 1993 b). The rules of these sign-mediated communication processes, both of the intra- and intercellular type,

are followed, occasionally even newly constituted, by real users of linguistic signs. They (the rules) are not only structured by the syntax of the genetic text, but also by the real life-world (Lebenswelt) of the complete organism; this itself constitutes situational contexts and contexts of experience, or finds itself within such contexts, and is primarily responsible for imposing special tasks/demands on cell associations.
Specific task-accomplishing strategies can be (but need not be) genetically fixed as experiences. This indicates that text-generating enzyme proteins use specific stimulatory patterns of the organism, which are the result of situational contexts in a real life-world (Lebenswelt), as a basis for their text generating activity. Such stimulatory patterns may be neuronal or may function in combination with chemical messenger substances as text-generating stimulatory patterns. Interestingly, evidence for this was provided not by socio- or molecular biologists, but by biochemists (Bonner 1983 a; Wyles/Kunkel/Wilson 1984; Wilson 1985). Hoffmeyers concept of code duality may be a very exiting perspective for researching especially these fields of biosemiotics.

Protein synthesis probably takes place in all organisms in the same manner. Otherwise one would not be able to arbitrarily combine the mRNA, tRNA and ribosomes of completely different species of organisms in a cell-free environment. The nucleic acid language is governed by a common syntactic law, yet the real life-world (Lebenswelt) of protein individuals, of the cell components and cell associations, as well as of those organisms whose life is maintained by these cell associations, determine the use of this language; they initiate the generative, sign-mediated communication processes (i.e., not random mutations due to radiation or mutagenic agants) in which this language is changed, transcended in its meaning, newly combined, or its complexity increased or reduced. Real life-world and the interacting, rule-abiding individuals that constitute them are indirect (via organismic body) co-constitutive for the sentence structure of the genetic texts (Witzany 1993 b, 1997).

Without a molecular pragmatism, neither the logic of the molecular syntax nor the molecular semantics that Manfred Eigen (Eigen 1975) deduces from it could be understood; furthermore, their explanation would remain reductionistic. Understanding the language of nature (nucleic acid language) requires a molecular semiotics (Witzany. 1993 a) that analyses and interprets the molecular interaction processes as sign processes (semioses). This would reverse the omission of the actual sign users in the intra- and intercellular communication processes and would incorporate their co-constitutive role in the structure of the genetic text and its expression.

This level of insight must be attained before one can legitimately refer to a language of nature: then we are no longer dealing with an explanatory model operating with metaphorical terms, but have an approach that enables us to understand and substantiate the conditions that establish the possibility of living organisms.

As long as molecular biology considers language to be an apriori for the evolution of organisms and, ultimately, also of human intellect, it has grasped language only syntactically/ semantically.

From the standpoint of language philosophy, we can legitimately refer to a language of nature in the evolution of organisms and in the evolution of human reason only after incorporating the pragmatic dimension of sign utilization and thus including both the real life-world (Lebenswelt) of the sign user and an understanding of its life-form.

A further example of how linguistic signs are constituted with meaning through the pragmatic usage context is provided by chemical messenger substances whose structure is the same but whose meaning differs in different communication processes. Thus, the same chemical messenger can assume an entirely different messenger function as a hormone than as a neurotransmitter in the communication between nerve cells.

The constitution of immunological memory is yet another example of how the interaction competence of the B-lymphocytes is co-constituted through pragmatic interaction:

After successfully warding off an infection, the B-lymphocytes which helped organize the defense remain present in the body as an immune memory. In the event of a renewed infection the immune response can proceed much more rapidly and more effectively. The immune response itself, however, is not genetically fixed, merely the structure of those proteins that organize the immune response. The immune response is the result of a complex identification and interaction process (Tonegawa 1985). On the other hand, the constitution of the immunoglobulins, in their incredible diversity, is the result of the variable combination of respective DNA sequences.

Here as well, sequence segments are not changed and combined automatically or randomly, but rather through enzyme proteins with combinatory competence. Using relatively few, variable sequence regions and following only a few rules, they produce a sheer endless number of easily distinguished identification proteins, which help organize a successful immune response. Highly complex interaction forms and mutually complementary communication types (intra-,inter-, and meta-organismic communication), not random sequence mutations, have led to the development of such an immune response competence. If the organization and structuring of such relatively simple biological processes is controlled by highly complex enzyme sign processes, then how much more plausible is the assumption that such sign processes are involved in actual evolutionary processes, in which much more complex symbol processes are required?

Enzyme proteins in particular, which combine and recombine genetic texts, provide evidence for an evolutionarily acquired competence in text processing. More specifically, recombination enzymes identify particular "recognition"- sequences as such and use this ability to carry out combinatory operations on the genetic text; in this manner they cut out semantically significant text sequences from the text assemblage and insert them somewhere else in the assemblage. The sequence combination itself is governed by syntactic rules; the exact nature of their combination is under the influence of pragmatic conditions. The real life world (Lebenswelt) of the affected cells and molecular structures of a complete organism form the evaluation function which constitutes the actual text combination as a meaning function.

The metaphor involving the „language of nature“, as applied by molecular biologists, should not be rejected out of hand. Nevertheless, to justify referring to a language of nature in the sense a philosophy of language requires an expansion of the reductionistic language concept of molecular biology. This would enable an understanding of living nature based not on metaphors but on a reconstruction of historical intercommunication situations and forms. The discussion about the language of nature opens new interpretation possibilities for observations in the realm of living nature - avenues that would principally be closed to reductionistic research methods.

Epilog

These two examples, intraorganismic communication and intraorganismic communication gave some practical examples for the critical remarks before. I want to emphazise, that this review is written to support biosemiotic research. The critical remarks on some problems in Hoffmeyers concept in the light of theory of science should lead to a combination of modern biosemiotics and the results of universal pragmatic theory of communication. I am convinced, that this combination will be able to remark to central structures of life.

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