

Reduction of biological phenomena?

Deficits of systems theory and the alternatives

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I will try to answer the question whether systems theory is helpful for understanding phenomena of living nature like sign-mediated, rule-governed interaction, i.e. language and communication. Systems theory is the theoretical foundation for researching the capacity of formal systems. A system here is defined in a strictly formal manner as a quantity of elements and a quantity of relations between these elements which constitute a structure. In cybernetics the point is dynamic systems whose elements are active and which suffer influences or exert influences. These relations can be realised very differently, for example as material relations, energetical relations or as informational relations. More complex types of systems can stabilize themselves within certain levels. Very important: The relations between the elements of a system and its possibilities of behavior can be represented formally *without respect to the kind of realisation*. Cybernetic systems theory is a very abstract theory of dynamic, self-regulating systems and is applied because of its abstractness to very different fields like technology, biology, psychology, sociology, economics, etc. The precondition for the cybernetic systems theory was the development of the mathematical theory of formal systems and therein the theory of scientific models.

An important term within systems theory is „information“. To find a definitive definition of „information“ is as difficult as one for the terms „mass“ or „energy“. Sometimes „information“ is confused with meaning. The attempt to apply information theory to all dimensions of communication and interaction was unsuccessful. Shannon found a fundamental formula for identifying symbol arrangements. The measure of information is equivalent to the amount of „yes-no-decisions“ necessary to identify a symbol .

The cybernetic systems theory also deals with information processing. Dynamically self-regulating systems are defined as realisations of algorithms. An algorithm specifies the method of how many steps someone needs to solve a problem. Machines can calculate only those functions for which algorithms exist. If human beings define themselves as learning machines whose language is principally formalizable, then the systems theory of sociology becomes interesting. If human beings define themselves as communicating and interacting individuals in the framework of a historical heritage, who sometimes work with the term „system“, then it is important to pose the question about the position of the term „system“ in the long history of science. If systems are able to stabilize themselves and are also able to ensure for survival of the system, then the question arises whether they are able to think about social targets *beyond* these abilities. Because the real lifeworld (Lebenswelt) has an historical heritage, decisions about responsible social structures of the future must integrate a number of necessities of different social groups. The necessities are part of the real lifeworld (Lebenswelt) of these groups and therefore represent cultural specificities in everyday language which are not formalizable.

Alain Turing proposed that there would be equality between human beings and machines if the human being could not decide between communication with a machine or with a human communication partner. But this behavioristic point of view on consciousness as a process of an input-output machine is unable to define human communication in all aspects. Moreover Gödel proved that in every complex system there is one formula or utterance which can neither be proved nor refuted. Because every cybernetic machine is a realisation of a formal system, there also must exist one undecidable formula. If a person thinks about this undecidable formula in a non formalizable language he or she has the opportunity to determine whether this formula is true or false. For a machine this is impossible. The incompatibility between cybernetic systems theory and the selfunderstanding of human beings is evident because there are many human behaviors that are understandable in a strict sense, but they cannot be explained through systems theory.

The cybernetic systems theory has a last chance to justify the universal application to all fields of science: If it postulates that its highly abstractive construction of scientific models is no longer a model but reality. Then the ontology of systems theory would make criticism impossible - adaptation would be the only possibility, because human subjects would be explainable as subsystems of social systems. This would be an *abstractive fallacy*. And as we have seen communication and finding consensus between human subjects within not formalizable life worlds is indispensable, because this criterion is necessary for action under the aspects of history. Therefore social communities need innovative forms of acting which cannot be distilled from systems of selfstabilization.

As Gödel and Tarski proved, any formal system is principally not closed. If reasons must be given for formal systems one has to go back to speechacts in communicative practice of subjects. Speaking and communication between subjects in real lifeworld (Lebenswelt) ist not reconstructable in a pure syntactic or syntactic-semantic way. Since Charles Morris we know, that a complete explanation of language requires syntactic, semantic and pragmatic rules. None of these three criteria is reduceable to another. And since Wittgenstein we know that in the last of all metalanguages - in everyday language - the context of usage is decisive for the meaning of words and utterances. „The shooting of the hunters“ could have two completely different meanings. It could mean that the hunters are shot, it could mean that hunters are shooting. Only the situation of subjects in real life would give the correct meaning in context. This decision is impossible after syntactic or syntactic/semantic analysis.

What are the alternatives to the cybernetic systems theory to better explain and better understand the human language, as well as sign processes between non- human living individuals. What is the alternative for better understanding language and communication in general.

It has its foundation in universalpragmatic theory of communication such as Jürgen Habermas developed¹ and, especially for semiosis in the living world of all organismic kingdoms, a theory of communicative nature².

¹ Jürgen Habermas : What is Universal Pragmatics?. In: „Communication and Evolution of Society. Boston: Beacon Press, 1979. Jürgen Habermas: Theory of Communicative Action, Vol. I, London: Heinemann, 1985. Vol. II, London: Blackwell 1989. Jürgen Habermas: Actions, speech acts, linguistically mediated interactions and the lifeworld. In: Floistad, G. (ed.), Philosophical problems today, Vol. 1, Kluwer Academic Publishers. 1994. p.45-74

² Günther Witzany: Natur der Sprache - Sprache der Natur. Sprachpragmatische Philosophie der Biologie. Würzburg: Königshausen & Neumann, 1993.

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Speech is a form of action, and I can understand this activity if I understand the rules governing the activity. This means I can also understand an act that runs counter to the rules. Everyday language usage reflects everyday social interactions of the constituent individuals. The prerequisite for fully understanding statements is the integration of the understander in customs of social interaction and not a knowledge of formal syntactic-semantic rules. A prior condition for all formalizations in scientific artificial languages is a factual, historically evolved, communicative experience. This very precondition becomes an object of empirically testable hypothesis formation in the language model of cybernetic systems theory. And at this point this model becomes paradoxical because it seeks to theoretically grasp language with tools that are themselves linguistically predetermined.

The undecidable formula in every principally not closed system can be shown to be true or false by means of a non-formal language. This non formal language is the very tool that enables the language itself to be discussed. The machine is unable to do this because no algorithm is available with which a cybernetic machine can determine its underlying formal system.

The fact that the paradoxes arising within an object language cannot be solved with language, led to a differentiation between object language and metalanguage. Nonetheless, paradoxes can also appear within metalanguage; these can only be solved by splitting into metalanguage, meta-metalanguage and so forth in an infinite number of steps. This unavoidable gradation of metalanguages necessitated resorting to informal speech, developed in the context of social experience, as the ultimate metalanguage. It provides the last instance for deciding on the paradoxes emerging from object- and metalanguages. Neither the syntax nor the semantics of a system can be constituted within that particular system without resorting to the ultimate metalanguage. In everyday language I can change between artificial language and everyday language as I like, the machine and her formal object language can never change in a non formal language.

The inability of cybernetic systems theory or information theory to establish and justify of either concept to explain central processes and structures of living nature is apparent. If we take instead of syntactic/semantic explanatory models of systems theory an universal pragmatic point of view, the real usage contexts are most important. The pragmatic intercommunication situation is characterized by the complementary that is indispensable for the constitution of meaning. Sign mediated communication can only extract meaning from signs within a setting involving a reciprocal confirmation between language usage and daily life; for the sign using subject, this transparent framework enables expression and permits successful intercommunication about a chosen topic. The pragmatic sign-usage situation is ultimately constitutive for the meaning of language application and speech behavior. Wittgenstein termed this situation „linguistic game“ and K.O. Apel very aptly differentiated this term as „a `life-form´, a functioning unit of language usage, living expression, behavioral custom and worldly openness.“³

Günther Witzany: From the `logic of the molecular Syntax' to molecular pragmatism, In: Evolution and Cognition, Vienna University Press, Vol.1, No.2, Vienna, 1995. p. 148-168.

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Günther Witzany: Explaining and understanding LIFE. In: Semiotica 120 - 3/4. Berlin, New York : Walter de Gruyter, 1998. p. 421-438.

³ Karl Otto Apel: Transformation der Philosophie. Frankfurt: Suhrkamp, 1976, Vol. I, p. 321

As shown through different disciplines of biological research, rule governed interaction is the mainly behavior in species specific methods of behavioral coordination. So in zoosemiotics, there are thinkable also a semiotic of protoctists, fungi and plants because the involved scientists speak about interaction processes and substances which transport signals in complex semiosis. And in molecularbiology James D. Watson speaks about communication processes in cells and between cells in a very differentiated way of argumentation. So the alternative to the reduction of biological phenomena through systems theory which uses objective language and communication only under syntactic-semantic aspects, it is senseful to develop a theory of communicative nature. There would be a research under the aspect of syntactic, semantic and pragmatic point of view on language and sign-processes. If someone prefers this theory of sign processes in living nature, semioses become more interesting because of the situational context in which one and the same sign means something and in the other context something complete different. So I have nearly the same possibilities as in the DNA code. We have a finite number of signs a finite number of syntactic, semantic and pragmatic rules of sign usage and a infinite number of DNA texts or possibilities for real speechacts between individuals in interaction. For example in diagnostic methods of psychosomatics this theory of communicative nature is much more helpfull than systems theory.

In a theory of communicative nature there would be three types of communication biological organisms are involved during the course of their lives:

- a) every organism consists of cells. The investigation whether sign processes take place within a cell (intracellularly) or between cells (intercellularly) can be subsumed under the title „intraorganismic communication“
- b) The investigation of sign processes between members of the same species can be subsumed under the title „interorganismic communication“
- c) The investigation of sign processes between organisms belonging to different species can be subsumed under the title „metaorganismic communication“

The term „system“ is helpful if we investigate new fields of research or knowledge, to define a number of elements and a number of relations between these elements. The theory of communicative nature is helpful if we want to understand the interrelations and the rule governed, sign mediated interaction between living individuals with their species specific history within a evolutionary history of living nature. We must always keep in mind that the sign users or interpreters involved in a sign mediated interaction do not represent monadologic, isolated individuals; rather, they are members of a species specific lifeworld (Lebenswelt) that share an evolutionary heritage and whose behavior is subject to a commonly shared repertoire of rules. The understanding of living nature as a universal community of sign mediating interactors is closer to reality than their reductional interpretation as systems or part of systems or interrelation between systems as principally formalizable structure. History is principally not formalizable, especially history of living individuals in their species specific lifeworld (Lebenswelt).