Cybersemiotics: A New Foundation for Transdisciplinary Theory of Information, Cognition, Meaningful Communication and the Interaction Between Nature and Culture

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Abstract: Cybersemiotics constructs a non-reductionist framework in order to integrate third person knowledge from the exact sciences and the life sciences with first person knowledge described as the qualities of feeling in humanities and second person intersubjective knowledge of the partly linguistic communicative interactions, on which the social and cultural aspects of reality are based. The modern view of the universe as made through evolution in irreversible time, forces us to view man as a product of evolution and therefore an observer from inside the universe. This changes the way we conceptualize the problem and the role of consciousness in nature and culture. The theory of evolution forces us to conceive the natural and social sciences as well as the humanities together in one theoretical framework of unrestricted or absolute naturalism, where consciousness as well as culture is part of nature. But the theories of the phenomenological life world and the hermeneutics of the meaning of communication seem to defy classical scientific explanations. The humanities therefore send another insight the opposite way down the evolutionary ladder, with questions like: What is the role of consciousness, signs and meaning in the development of our knowledge about evolution? Phenomenology and hermeneutics show the sciences that their prerequisites are embodied living conscious beings imbued with meaningful language and with a culture. One can see the world view that emerges from the work of the sciences as a reconstruction back into time of our present ecological and evolutionary self-understanding as semiotic intersubjective conscious cultural and historical creatures, but unable to handle the aspects of meaning and conscious awareness and therefore leaving it out of the story. Cybersemiotics proposes to solve the dualistic paradox by starting in the middle with semiotic cognition and communication as a basic sort of reality in which all our knowledge is created and then suggests that knowledge develops into four aspects of human reality: Our surrounding nature described by the physical and chemical natural sciences, our corporality described by the life sciences such as biology and medicine, our inner world of subjective experience described by phenomenologically based investigations and our social world described by the social sciences. I call this alternative model to the positivistic hierarchy the cybersemiotic star. The article explains the new understanding of Wissenschaft that emerges from Peirce's and Luhmann's conceptions.

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An Overview of the Flow of the Argumentation in the Article

I begin with a brief introduction to my view of scientific thinking on deep theories and a few words about the limitation of the word 'science' in the English language and my proposal to use the German transdisciplinary term 'Wissenschaft', which includes qualitative research into meaning. I argue that it is vital to include the meaning aspect of reality when we deal with information, cognition and communication research. I will then briefly introduce my cybersemiotic visual model for organizing the exact, the life and the social science as well as the humanities in a framework shaped as a star with four different arms, a framework which I propose as an alternative to the positivistic 'unity of science' idea based on physics as model science and its modern version found in E. O. Wilson's 'consilience' model. Cybersemiotics is a vision of how to integrate truth and meaning as well as the empirical and the experiential aspects of knowing in one pragmatic and semiotic view of the collective production of knowledge. I will then explain the phenomenological model behind Peirce's phaneroscopically based semiotics. I briefly introduce his three categories and his idea of a philosophical foundation for a reflected *cenoscopic* science. I then briefly explain Maturana and Varela's idea of autopoiesis and after that try to show how Luhmann's triple autopoietic systems view of socio-communication has a reflected pragmatic and realistic grounding that fits in with and supplements Peirce's philosophy. I go on to explain the development of biosemiotics as an attempt to build a semiotic link from the life sciences to the social sciences and humanities through an evolutionary and ecological semiotic view. As the pan-informational and pan-computational philosophy tends to be more and more dominating, I find it necessary to explain how Peirce's philosophy, which he calls pragmaticism, can be seen as an alternative. As Peirce lived a hundred years ago, my argument draws on modern American philosophers like Sellers, McDowell and Brandom.

Since Plato's philosophy of a world of ideas and universal concepts was confronted by modern empiricism's belief in material facts, the discussion on inter- and transdisciplinarity has been about what is most real: matter, forces, form or universal concepts. The possibility of transdisciplinarity therefore rests on our ability to define a reality that includes them all. Peirce's suggestion of a scholastic realism inspired by Duns Scotus is such an attempt and I shall try to explain what it is all about. Peirce introduces time and possibility to enlarge our view of reality. W*hat is*, and *what has been* only cover the part of actuality, which is based on the past. There are, however, also *would be's* dealing with probabilities. Peirce – like Popper and Prigogine – views possibilities as real and includes them in his category of *Firstness*. But they are also the basis for habits or what Peirce calls *Thirdness*. Peirce distinguishes between what is real and what exists. The only form of existence as such is what he calls 'thisness' (haeccity), which is his category of *Secondness.* It is this triadic processual understanding of semiotics that distinguishes Peirce's semiotics from Saussurian semiology and makes the idea of biosemiotics possible. I then try to visualize how we may combine biosemiotics' idea of endosemiotics creating the biological self and its exosemiotic communication theories with Luhmann's triadic autopoiesis model of communication. This is done in order to give a first overview of the cybersemiotic idea and to explain how the integration of semiotics and system theory offers a more plausible model of

evolution that can explain the emergence of mind. The article concludes by suggesting a new model of five ontological levels and a changed view of the reality of nature.

A New Foundation for the Sciences[2] and Humanities

Cybersemiotics proposes a new transdisciplinary framework integrating Peirce' triadic semiotics with a cybernetic view of information on the basis of an ontology of emptiness. It is an attempt to give a transdisciplinary solution to C.P. Snow's two-culture problem. The proposed framework offers an integrative multi- and transdisciplinary approach, which uses *meaning* as the overarching principle for grasping the complex area of cybernetic information science for nature and machines *AND* the semiotics of all living system's cognition, communication, and culture. Cybersemiotics is an integrated transdisciplinary philosophy of science allowing us to perform our multidisciplinary research, since it is concerned not only with cybernetics and Peircean semiotics, but also with informational, biological, psychological and social sciences. In order to incorporate the sociological disciplines and contributions from multiple areas of applied research cybersemiotics draws extensively on Luhmann's theories.

We are thus immersed in conscious and unconscious communication forms, verbal as well as non-verbal. As the linguistic turn argues, we cannot escape language, nor culture and power. Even science becomes a social construction, which is historically true, since science is a relatively recent phenomenon in the history of man. Empirical and mathematically grounded science is a modern invention that started in the Renaissance. Scientific knowledge has formed our rationality and cultural outlook on the world since then and right up to the global discussion these days about the reality of global warming.

And yet science is still faced with the problem of meaning. The background of cybersemiotics is the recognition that Western philosophy of science is in a state of crisis. Western culture is at a turning point when it comes to taking the final step into a *knowledge culture* based on information and communication technology. Rather than basing our culture on the conception that the highest goal of knowledge is an abstract, non-embodied and globally available (artificial, impersonal) intelligence of information programs, I believe that we should ground our culture(s) on embodied human living (personal as well as interpersonal), i.e. on semiotic intelligence as part of both living nature and human culture, rather than only on the physical science and the worldview behind it.

The current dominant objectivist science, which to me includes physicalism, eliminative materialism, cognitive sciences based on the information processing paradigm, cannot encompass self-aware consciousness and social-communicative meaning as causal agents in nature. Current cognitive science attempts to explain human communication from the outside without recognizing the phenomenological and hermeneutical aspects of existence. Its conception of human (meaningful) language and communication as a sort of culturally developed program for social information processing between computational brains/ minds cannot explain the evolution of embodied consciousness and (meaningful) human language and communication.

[2] For me the concept 'sciences' refer to natural, life, technical as well as social sciences. With a background in biology I consider the life sciences to assume a different ontology from that of physics and chemistry, which do not operate on the premise of life as biology does.

Cybersemiotics offers a new *ontology* that can encompass a moderate version of the ontologies of all four dimensions or spheres.

Inspired by the methodology of critical realism (Bhaskar, 1997, 1998) and Bourdieu (Bourdieu and Wacquant, 1992), I believe that our common sense only shows us the surface of reality, and that it is the task of the sciences to dig deeper and look further than our common sense assumptions. I agree with Gadamer (1989) that our cultural history is also a development of our knowledge about ourselves, society and nature forming a common knowledge horizon.

Therefore I agree with Karl Popper that it is the role of scientists and philosophers to boldly invent new ways of looking at reality, knowledge and ourselves. Take for instance Einstein and Bohr, who forever changed the way we understand matter, energy, time, space and knowledge, or Norbert Wiener who introduced information as a basic ontological component in his transdisciplinary cybernetic worldview.

I see the semiotic philosopher C. S. Peirce(1839-1914, see his collected papers: Peirce 1931-1935) as such a bold inventor, one who had important and profound ideas about the development of human knowledge development long before Karl Popper (1960, 1962, 1972, 1974, and 1976) and Roy Bhaskar (1997, 1998) published their theories. Peirce created a whole structure of philosophy, science and humanities through his semiotic philosophy (inspired by Dons Scotus and Kant), which includes a transdisciplinary theory of meaning, signification and communication. In a somewhat supplementing vein Niklas Luhmann (1990, 1995) – originally inspired by Talcott Parsons' (1902 –1979) structural functionalism – developed a social system theory that views social communication as the basic reality of society and integrates the psychic and the biological autopoietic systems. Luhmann borrows the concept of autopoiesis from the cybernetic biologists Humberto Maturana (1983, 1988a, 1988b) and Francisco Varela (1980, 1986).

It is my view that these two interdisciplinary theories may be combined into a transdisciplinary framework that I call *cybersemiotics*. I firmly believe that cybersemiotics constitutes a realistic foundation for a comprehensive understanding of the natural, life and social sciences as well as humanities and that it can provide a deeper understanding of the differences in the knowledge types they produce and show why each and every one is necessary.

By establishing this new framework, I also hope to create a transdisciplinary approach which transcends the incommensurability between C.P. Snow's two cultures: science-technology versus the humanities and the social sciences. I am trying to draw up a map onto which a multitude of viewpoints can be plotted and their subject areas characterized and compared with other approaches. In doing so, I hope to expand the dialogue between the exact sciences, the humanities, the social sciences and philosophy. A more comprehensive and further argued version of cybersemiotics can be found in the foundational book *Cybersemiotics: Why Information Is Not Enough* (Brier, 2006) as well as later articles on the subject (Brier, 2007, 2008a, 2008b, 2008c, 2008d, 2009a, 2009b, 2010, 2011).

The Four Views of the Cybersemiotic Star

My theory and philosophy of science (Brier 2006)[3] is that in a total naturalism the four basic approaches to understanding provided by the exact natural sciences, the life sciences, the phenomenological-hermeneutic humanities and the discursive view of sociology: cognition, communication, meaning and consciousness are all equally fundamental but need to be united in a transdisciplinary theory of information, semiotics, embodied consciousness and intersubjective communication. The cybersemiotic star in figure 1 is a visual model of this theory at the core of which we find the autopoietic semiotic praxis from which our knowledge springs.

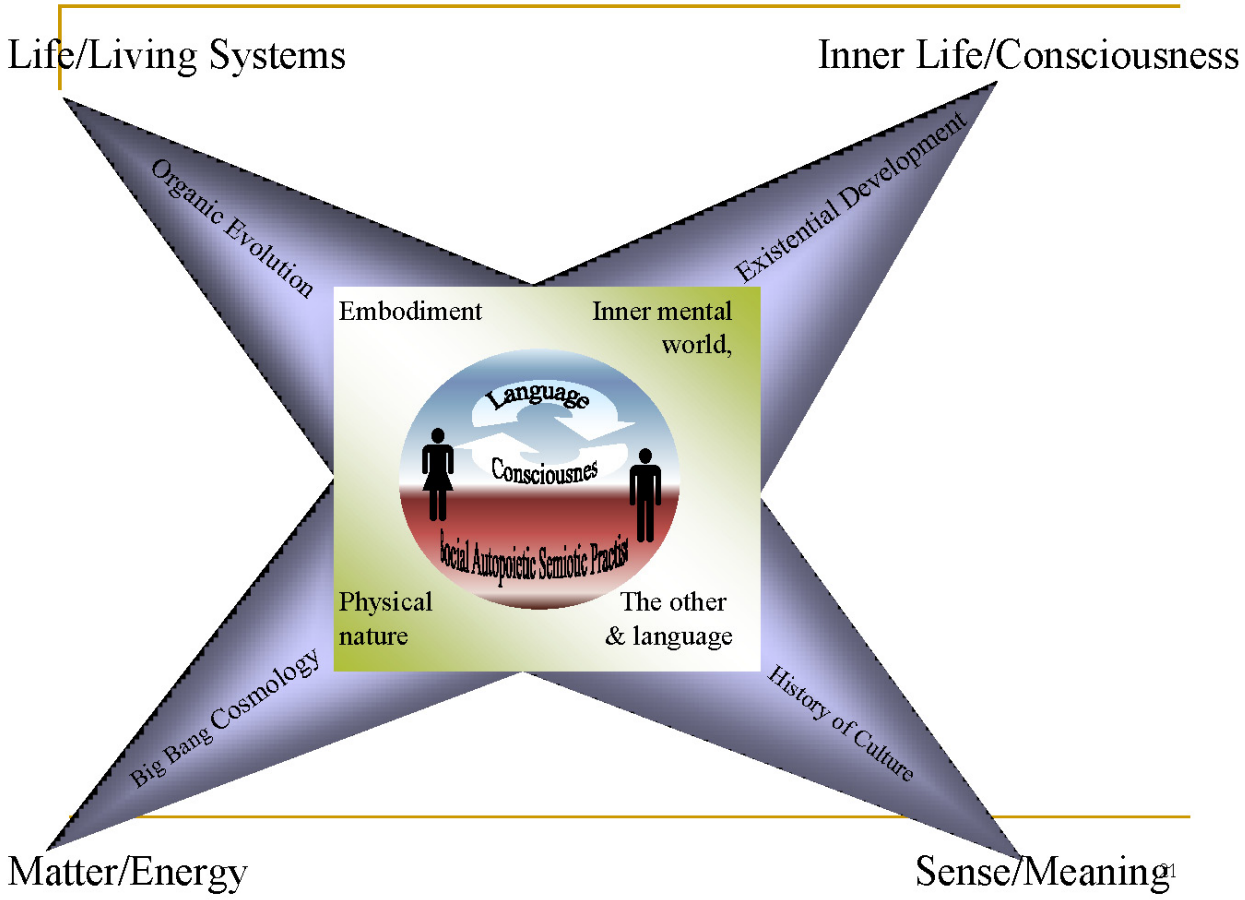

Figure 1: ***The cybersemiotic star****: A diagram of how the communicative social system of embodied minds' develops four main areas of knowledge. Physical nature is usually explained ontologically as originating in energy, matter and information. Living systems are seen as emerging from the development of life processes (such as the first cell). Social culture is explained as founded on the development of meaning and power in language and practical habits, and our inner mental world is explained as deriving from the development of our individual life world and consciousness, where consciousness is a given unexplainable fact.*

[3] I have been teaching interdisciplinary philosophy of science in several universities, programs and levels over the last 30 years.

This transdisciplinary framework posits, firstly, that in order to produce intersubjective knowledge as Wissenschaft[4] it is necessary to accept the reality of language, autopoietic embodied minds, culture, and non-cultural environment, and, secondly, that the discussion about transdisciplinary knowledge takes place in a semiotic-linguistic discourse with other embodied and linguistically informed consciousness beings in a common praxis combining non-cultural and cultural signification spheres.

The Center of the Star

From this intersubjective interaction springs four main spheres of knowledge interests, which each attempts to explain all of reality. The primary type of knowing[5] seems to be the first person knowledge interest based in the origin and function of experiential mind and subjectivity. The approach taken from "the inside"[6] is in Western culture the phenomenological investigating of the "life-world" (Lebenswelt) in a Husserlian *phenomenology* (Husserl, 1970, 1997, 1999), or Peirce's version (Peirce, 1931-1935), on which he bases his semiotic and which he calls *phaneroscopy* (Spiegelberg, 1965[7]). When the experiential worlds interact with others they create the intersubjective signification spheres that we call cultures. When we study socio-communication and acting from the point of language, we are using meaningful language to perform the act of studying other meaningful languages. As von Foerster (1988) writes, everything said by an observer is said to another observer. Furthermore, Wittgenstein (1958) argues then there are no private languages or language games, to which we can add that there are no private sign games, either, and that all knowledge comes to us through signs. This is the pragmaticist semiotic foundation of my transdisciplinary alternative to the notion of unity of science which the logical positivists derived from their view of physics as a model science. Instead of a hierarchy we have a star with a pragmaticist sign system theory in the middle accepting the language turn, without giving up any type of realism. It is important to acknowledge that neither Peirce nor Luhmann are ontologically radical constructivists (Rasch, 2012). Like Peirce, Luhmann considers reality as the precondition of all knowledge production. But knowledge is knowledge, not reality in itself.

In the first person approach, which is usually called phenomenological, but which we here with Pierce will call *phaneroscopic*, we deal with impressions and expressions of consciousness as the processes of sense experience and thinking in a state before sciences divided the world into subjects and objects. Merleau-Ponty (1962, p. vii) writes:

> Phenomenology is the study of essences; and according to it, all problems amount to finding definitions of essences: the essence of perception, or the essence of consciousness,

[4] As 'science' tends to be understood as only the exact natural sciences I was looking for a concept that could encompass the exact, the life and the social sciences as well as the humanities in one word. This is exactly what the German concept *Wissenschaft* does.

[5] Knowledge as a process.

[6] An expression they would not accept as it assumes an outside as fundamental as consciousness and therefore constructs a radical dualism like Descartes, the critical analysis of which Husserl used to create the paradigm of phenomenology (Husserl, 1999).

[7] Spiegelberg's two volumes form one of the major historical accounts of the phenomenological movement in Europe and America.

> for example. But phenomenology is also a philosophy which puts essences back into existence, and does not expect to arrive at an understanding of man and the world from any starting point other than that of their 'facticity'. It is a transcendental philosophy which places in abeyance the assertions arising out of the natural attitude, the better to understand them; but it is also a philosophy for which the world is always 'already there' before reflection begins—as 'an inalienable presence'; and all its efforts are concentrated upon re-achieving a direct and primitive contact with the world, and endowing that contact with a philosophical status.

Phenomenology holds that conscious experience, in both its subjective and intersubjective versions, comes before science, and is therefore not something that is in need of or can possibly be explained scientifically (from a materialistic or informationalistic point of view). This is in direct confrontation with scientism and the physicalist philosophy that empirically based scientific knowledge is the sole foundation of a rational world view. No one has in a short form expressed it more clearly than Merleau-Ponty who in the following quote views *the natural as well as the social sciences as secondary to the phenomenological stance:*

> Science has not and never will have, by its nature, the same significance qua form of being as the world which we perceive, for the simple reason that it is a rationale or explanation of that world. I am not a 'living creature' nor even a 'man', nor again even 'a consciousness' endowed with all the characteristics which zoology, social anatomy or inductive psychology recognize in these various products of the natural or historical process. I am the absolute source, my existence does not stem from my antecedents, from my physical and social environment; instead it moves out towards them and sustains them, for I alone bring into being for myself … the tradition which I elect to carry on. (Merleau-Ponty, 1962, p. ix)

What Merleau-Ponty describes here is the subjective and intersubjectively shared first person experiential consciousness, as its own first cause, which for Peirce is semiotically based. Neither Peirce nor Husserl view consciousness as primarily a product of the brain or of culture and language. All perception is embedded in consciousness even in such rudimentary form as pure feeling in Firstness. This basic phenomenological position is shared by Edmund Husserl, Maurice Merleau-Ponty and Charles Sanders Peirce's[8] (Spiegelberg, 1965) and the latter's development of a triadic[9] phaneroscopy is the point of departure for his semiotics. Here is one of his foundational formulations:

[8] I find these three authors most relevant for the problem I want to discuss here, and there are multiple references in the reference list to these writers, which I have selected as the most interesting defenders of the phenomenological transdisciplinary view. I am well aware that there is a multitude of others, too.

[9] When analyzing Peirce's work it is clear that his three categories are foundational to his whole semiotic and pragmaticist paradigm and that they were developed over many years. Pierce attempted to prove mathematically that triadic relations cannot be broken down to duals, but it has never been widely accepted that he managed to do so. However, I find the phenomenological argumentation very convincing and these days supported by many other developments in science. The fundamentality of the triadic thinking is the reason why many scholars have been reluctant to accept Peirce's paradigm. But one should not under-estimate the extent to which deep reflections of logic - including the logic of relations, time, reality, continuity, the moment, perception and meaning - are connected to this path-breaking invention of Pierce. Joseph J. Esposito (1980) *Evolutionary Metaphysics: The development of Peirce's Theory of Categories* describes this quest in a most profound way.

> Phaneroscopy is the description of the *phaneron*; and by the *phaneron* I mean the collective total of all that is in any way or in any sense present to the mind, quite regardless of whether it corresponds to any real thing or not. If you ask present *when*, and to *whose* mind, I reply that I leave these questions unanswered, never having entertained a doubt that those features of the phaneron that I have found in my mind are present at all times and to all minds. So far as I have developed this science of phaneroscopy, it is occupied with the formal elements of the phaneron. (Peirce, CP[10], 1.289)

The formal phaneroscopic elements inspired from pure (abstract) mathematics can then be derived from the combination of a phenomenological and a mathematical analysis:

> It seems, then, that the true categories of consciousness are: first, feeling, the consciousness which can be included with an instant of time, passive consciousness of quality, without recognition or analysis; second, consciousness of an interruption into the field of consciousness, sense of resistance, of an external fact, of another something; third, synthetic consciousness, binding time together, sense of learning, thought. (Peirce, CP 1.377)

Peirce's phaneroscopy differs from Husserl's phenomenology by assuming a theory of mind and matter as a continuum. Peirce is a synechist and sees continua as fundamental. One way to explain the continua between mind and matter is to see mind as partly hidden inside matter; another way would be to say that the "beginning" of physics is not the only one, as physics' grand story does not seem able to explain experiential consciousness nor existential or socio-cultural meaning. Peirce also realizes that, as it is done in Husserlian phenomenology, we have to take seriously the observing and knowing ability of the human animal before it started making science. It is the prerequisite we must recognize before we can make any evaluation of scientific knowledge. Deely (1990) argues that Peircean semiotics is a perspective that arises from the attempt to create a ground common to all methods or, one could say, before all methods. From this point of view, it becomes clear that Peircean semiotics is a doctrine of the study of the action of signs. It is what he calls a *cenoscopic* science.

Peirce (CP 1.181) divided the sciences into three types: 1. A science of discovery, 2. A science of review, and 3. Practical sciences. It is within the sciences of discovery that we find the concept of "cenoscopy." Peirce divides the science of discovery into three subtypes: (1) (Pure) mathematics, understood as that science which draws necessary conclusions about hypothetical objects; and (2) cenoscopy, which he also calls primary philosophy and which is about all positively perceived phenomena in general (inner or outer) that confront a person at every waking moment. This is where Peirce places his phaneroscopy. Finally the (3) idioscopic sciences, which is his name for the special or positive sciences. They have the purpose of discovering new phenomena through observation and experiments. Peirce (CP 1.288) also states:

> Cenoscopic science, with its philosophical reflections, precedes the special or idioscopic sciences and is the place from where their individual contributions to man's knowledge of himself and the world should be evaluated and reflected upon.

[10] CP stands conventionally for Collected Papers, which can be found as Peirce (1931-) in the reference list. The first digit is for the book number, the following number refers to a paragraph.

Thus, this article is cenoscopic in genre.

What distinguishes Peirce's phaneroscopy from Husserl's phenomenology is that not all elements in the phaneron are studied. Phaneroscopy focuses only on the elements that are indecomposable in a sort of pure mathematical and logical reflection. These indecomposable phaneroscopic elements exemplify the most basic universal categories for perception and cognition and therefore become philosophically foundational. Peirce explains more about them in this quote:

> Of the three Universes of Experience familiar to us all, the first comprises all mere Ideas, those airy nothings to which the mind of poet, pure mathematician, or another might give local habitation and a name within that mind. Their very airy-nothingness, the fact that their Being consists in mere capability of getting thought, not in anybody's actually thinking them, saves their Reality. The second Universe is that of the Brute Actuality of things and facts. I am confident that their Being consists in reactions against Brute forces, notwithstanding objections redoubtable until they are closely and fairly examined. The third Universe comprises everything whose being consists in active power to establish connections between different objects, especially between objects in different Universes. Such is everything which is essentially a Sign – not the mere body of the Sign, which is not essentially such, but, so to speak, the Sign's Soul, which has its Being in its power of serving as intermediary between its Object and a Mind. Such, too, is a living consciousness, and such the life, the power of growth, of a plant. Such is a living constitution – a daily newspaper, a great fortune, a social 'movement.' (Peirce, CP 6. 455)

The dynamic interactions between these three categories brings forth the triadic sign, where the representamen is a type of Firstness, the object is a type of Secondness and the interpretant is a type of Thirdness. Together they produce meaning in all the living sign-producing beings in the form of primary modeling as a signification sphere (or animal life world) and a secondary modeling in the form of sign games (cf. Cobley, 2010b).

In humans, a grammatically ordered generative system of signs obtains a special social function as the type of modeling system we call "natural language." Language emerged as an evolutionary adaptation over two million years ago. Maybe it started as a mute semiotic modeling system in Homo Habilis (Sebeok & Danesi, 2000). Peirce's semiotics is a kind of double hypothetical realism, since he believes in a reality that is partly independent from the observer. At the same time he is keenly aware of the fact that the embodied observer is a product of this same reality, which thus anchors the result of scientific investigations in a realist evolutionary framework including an ontological place for the phaneroscopic first person experience (Turisi, 1997). A solution to this is attempted in the cybersemiotic star. This view eliminates a pure materialistic and deterministic ontology and places meaning as a central part of reality as in Luhmann's paradigm (Stäheli, 2012). This is why Luhmann's theory belongs in the middle of the model integrated with Peirce's theory.

Luhmann, was – as briefly mentioned above – inspired by Maturana and Varela's biological theory of autopoiesis. He extended their autopoietic model to the psychological as well as the socio-communicative level. Luhmann (1990) proposes a triple autopoiesis model, where both the biologic and psychic systems are silent and only the socio-communicative autopoietic system can

communicate. Biological autopoiesis functions in the medium of life whereas psychic autopoiesis and the socio-communicative autopoiesis both function in the medium of meaning. Thus communication consists of autopoietic systems. This is demonstrated in Luhmann's provoking punch line: "Only communication communicates!" He sees communication as an autopoietic self-organized complex system. Communication is not subjects exchanging objective information! Luhmann (1995, p.149) defines communications as

> a completely independent, autonomous, self-referentially closed selection, a mode of constantly changing the forms of meaning material, of reshaping freedom into freedom under changing conditions, whereby (given the premise that the environment is complex enough and not ordered as pure randomness) experiences of reliability gradually accrue and are then re-included in the process. Thus a meaning world emerges through epigenetic evolution that makes possible communication that is less probable.

Science has shown us that reality is very complex and that the data we have collected empirically can be interpreted in many ways. There are many valid interpretations and none can be taken for granted. We cannot expect a common worldview. We have to negotiate a mutual understanding to find a common working definition. Luhmann (1995, p. 147) writes:

> If one conceptualizes communication as the synthesis of three selections, as the unity of information, utterance, and understanding, then communication is realized if and to the extent that understanding comes about. Everything else happens "outside" the unity of an elemental communication and presupposes it. This is especially true for a fourth type of selection: for the acceptance or rejection of the specific meaning that was communicated.

We are thus immersed in conscious and unconscious communication forms be they verbal or non-verbal. As the linguistic turn argues, we cannot 'get out' of language, nor culture and power. Semiotics furthermore says that we cannot escape from the world of signs as it is also the medium of our cognition.

Peirce's semiotics concords with Luhmann's system theory, Popper's critical rationalism and Bhaskar's critical realism in that it sees humans as able to create knowledge together in a synergy of language and praxis. But these views are not entirely constructivist because they recognise the empirical testing of theories and that our own cognition has its roots – through evolution – in the very same reality we are investigating. This synechistic unity with the rest of reality – which in Peirce's semiotic philosophy comes about primarily through signs, not matter – has considerable influence on forming the viability of our scientific knowledge.

Though we need to believe in an ultimate truth and to have truth as an ethical commitment in Wissenschaft we are also aware that there can be no final proof of our knowledge being a universal true statement or model. The belief in truth as a goal for Wissenschaft is, as Kant says, "a regulative idea", without which the whole endeavour would collapse. Thus the cybersemiotic star model has a constructing movement going one way from the social and phenomenological aspects and on the other hand empirical perturbations from the pragmatic aspect of reality going the other. These two movements interact through time like breathing and develop our knowledge system towards being more and more encompassing.

The Arms of the Star

It is interesting to note that there are four forms of historical explanation going on in the cybersemiotic star model: 1. The cosmological, 2. The biological evolutionary, 3. The social-historical, and 4. The personal-subjective. Each attempts to explain the whole reality from its own time perspective. The natural sciences for instance work towards making one grand historical explanation from matter over life to consciousness and cultural meaning. But so far we have not cracked the problem of the emergence of life and consciousness in evolution from a bottom up model (Laughlin, 2005).

This is why one of my central claims is that the natural sciences cannot stand alone as a kind of absolute knowledge ignoring the results of the social sciences and the humanities. Barrow (2007) is one of the scientists that discuss the limits of the attempts – mostly within physics – to produce theories of everything. Thus the problem this article addresses is how to make a new paradigmatic foundation that would enable us to integrate the knowledge of the study of embodied consciousness from the exact, as well as the life sciences, the social sciences and the humanities, without reducing one set of results to another. The idea is to avoid all types of reductionism, from scientistic to radical constructivist reductionism.

Consciousness seems to be a transdisciplinary problem because, among other things, it is the prerequisite of all Wissenschaft. Thus, like McGinn (2000), I think that the hard problem of consciousness is what we can actually know about our own knowing and experiencing and it is therefore also about the limits of scientific explanation. According to the analysis above I do not think that a "science of consciousness" is possible in the form in which we know science today.

A new and more transdisciplinary foundation for Wissenschaft needs to be constructed. *We might therefore have to accept that an all-encompassing explanation of the conscious meaningful human communication process cannot be provided from any of the corners of the model*. The crucial change in outlook brought about by this transdisciplinary framework is that in the end we cannot expect to be able to reduce our scientific explanations to one grand story. We must accept that we shall have to juggle with all four different aspects at the same time.

A radical social constructivist or 'strong' Marxist paradigm attempting to explain it all from the foundation of the social will meet with problems of integrating knowledge from both the exact and the life sciences. Thus the price for transdisciplinary co-existence or even integration is the relativizing of the overall importance of the approaches from each arm of the model! The new foundation for knowing and knowledge will not be physics, biology, the social or the phenomenological but the semiotic and autopoietically organized cognition and intersubjective communication understood from the perspective of a pragmatic, critical realism. In the following, I will develop the semiotic and system theory foundation of such a new view.

The Development of Communication in Humans

Cognition and communication are socially distributed, bio-physically embodied and culturally embedded, and there is an integration of the praxis of communication with the praxis of living, of language games with life forms, and of communicative competence with a general socio-cultural

competence. An instrumental-pragmatic view of linguistic communication conceives of the development of linguistic-symbolic behavior and the use of tools (technology) as co-evolutionary. Donald (1991) and Nelson (1998) believe that it all started with *homo erectus*' mimetic mind and culture. It was characterized *by re-presentational* and re-enactional intentionality in the use of fire to cook their food, and the institution of the sharing of food among family members. This is assumed to be the start of phatic communion and the development of symbolic codes.

Mimesis can be seen as the outgrowth of the primary, proto-semiotic, reflexive stage of languaging, which is securing coordination and community in the general primate episodic mind and culture. Here we go some three million years back (Donald, 1991). Mimesis is a precursor to the symbolic stage, with its social, communicative re-enactment side and its individual, cognitive re-presentational side. Mimesis stages would be from images, over diagrams, to *metaphors*. According to Donald's evolutionary theory (Donald, 1991) metaphoricity would include primitive 'narrativity' and he develops that theory further by arguing for the emergence of the mythic stage already in the Paleolithic epoch of the Stone Age about 35,000 years ago. Narrative skills are thus a fundamental part of the communicative competence of modern man, *homo sapiens sapiens*. 'Narrative thinking' in the form of Mythos is prior to analytic thinking, which is the characteristic of the theoretical, while empirically grounded scientific type of thinking and explanation. Meaning narratives are a prerequisite for objective science! Things, causalities and patterns have to make sense to us before we can even start to investigate truth claims about them! So, how do we integrate that knowledge, if not by including semiotics as for instance biosemiotics in our knowledge foundation?

Semiotics: Why Choose Peirce?

Semiotics (from the Greek word for sign) is the doctrine and science of signs, their use and how they produce and convey meaning. It is thus a more comprehensive system than language itself and can be used to understand language in relation to non-verbal forms of communication such as cognition and interpretation. One can trace the origins of semiotics to the classical Greek period (from the medical symptomology of Hippocrates) and follow important developments in the middle Ages (Deely, 2001). John Locke (re)introduces the label in the 17th century. But modern *semiotics* starts its development in the 19th century with Charles S. Peirce (1839-1914) and Ferdinand de Saussure (1857-1913). Saussure's paradigm is usually called *semiology*. Today, however, *semiotics* is often used as a meta-term for both. The two researchers worked independently of each other.

Saussure never wrote a book on semiotics himself. His *Cours de Linguistique Generale* is reconstructed from students' notes after Saussure's death in 1913 (Saussure 1969 [1913]). Nevertheless it founded modern linguistic theory. Though *semiotics* is now the recognized term for the common area of Saussure's and Peirce's work, they differ in their conception of a sign. Saussure took the sign as the organizing concept for linguistic structure, but Saussure's semiology is dualistic and language internal, and considers language as a self-organized system of internal differences based on a relation between sound and meaning. Its central idea is to analyze language as a formal system of differential elements. Thus, in structuralist semiotics signs do not refer to a reality outside language. Words and their meanings are defined by comparing and contrasting their meanings to one another inside the language system.

Peirce's semiotics is triadic and incorporates an external realistic reference in that he combines a *Representamen* with an *Object* through the creation of an *Interpretant* constructed by the observing system. According to Peirce (CP 2.302), 'we think only in signs' and perceptions work by constructing signs. The development of semiotics into a transdisciplinary scientific field is based on Peirce's triadic evolutionary and pragmaticist semiotics.

What Peirce attempted was to change our worldview in order to encompass the world of science and logic with the world of meaning and communication. In order to do so he created a common framework based on a triadic, evolutionary and pragmaticist theory of semiotics.[11]

Although semiotics emerged through efforts to investigate scientifically how signs function in culture, the 20th century has witnessed efforts to extend semiotic theory into the non-cultural realm, primarily in relation to living systems and computers. As Peirce's semiotics is the only one that deals systematically with non-intentional signs of the body and of nature at large, it has become the main source for semiotic contemplations of the similarities and differences of signs of inorganic nature, signs of the living systems, signs of machines (Nöth 2002 and 2009), and the cultural and linguistic signs of humans living together in a society and searching for information and knowledge. Thus Peirce' semiotics is behind the last 30 years of developing a biosemiotic theory of language communication.

Biosemiotics: The Connection Between Meaning, Rationality and Nature

Signs are mostly imbedded in a sign system based on codes (see below) like for instance alphabets of natural and artificial languages or ritualized behavior of animals where fixed action patterns like feeding young seagulls and grebes can acquire a sign character when used in the mating game. This last aspect from ethology was included under zoösemiotics by Thomas Sebeok in the 1960s (Sebeok 1965a, 1965b). He started to encompass animal's species-specific communication systems and their signifying behavior under the name zoösemiotics in 1972, resulting in the book *Perspectives in Zoösemiotics*.

Later Sebeok decided that zoösemiotics rests on a more comprehensive science of biosemiotics, a name that was coined in the beginning of the 1990s (Sebeok & Umiker-Sebeok, 1992). This global conception of semiotics equates life with sign interpretation and mediation and a view of semiotic that encompasses all living systems including plants (Krampen, 1981), bacteria and cells, for instance in the human body (called *endosemiotics* by Uexküll et al, 1993). According to one standard scheme for the broad classification of organisms, five super kingdoms are now distinguished: protists, bacteria, plants, animals, and fungi, thus the major classification categories in biosemiotics are: *bacteriosemiotics*, *protistosemiotics*, *phytosemiotics*, *mycosemiotics*, and *zoosemiotics*. Within zoosemiotics, anthroposemiotics encompasses the traditional semiotics of language and culture chiefly inspired by Saussure, but it also builds on the foundation of the endo-

[11] This new, but partly unfinished approach has attracted many researchers to attempt a consistent interpretation of his scattered work. These scholars include Apel (1981), Boler (1963), Brent (1998), Colapietro (1989), Corrington (1993), Fisch (1986), Deledalle (2000), Esposito(1980), Hookway (1992), Liszka. (1996), Menand. (2001), Murray (1961), Parker (1998), Savan (1987-1988), and Short (2007).

and exo-biological levels and semiotics of the other biological kingdoms mentioned, which are not present in structuralist semiology.

Ever since Umberto Eco (1976) formulated the problem of the "semiotic threshold" keeping semiotics within the cultural sciences; semiotics – especially Peircean semiotics – has developed further into the realm of biology crossing one threshold after another into the sciences. The ethology developed by Lorenz (1970-1971) and Tinbergen (1973) from the 1920s and on (inspired by Jacob von Uexküll) has for long pointed out that animals do react to certain aspects of nature or other animals as signs to be interpreted in fixed action patterns, and that animals communicate with these signs in a ritualized form that gives some of them a symbolic character (Brier 2008a). The efforts of Thomas Sebeok (see for instance Sebeok 1965a, 1965b, 1989, 1990; Sebeok & Danesi, 2000; Sebeok & Umiker-Sebeok, 1992) and Hoffmeyer (1996, 2008), as well as Emmeche (1998; Hoffmeyer & Emmeche, 1991) have led to the development of a biosemiotics encompassing all living systems, including plants (Krampen, 1981) and micro-organisms as sign generators and users (Nöth, 2001). Many humanistic researchers find this hard to accept, and accuse Peirce of defining the concept of sign too broadly by going outside intentional communication (Sonnesson, 2009).

Resulting developments have then been used to change the scope of semiotics from only cultural communication to a theory of biosemiotics that would also encompass the cognition and communication of all living systems from the inside of cells to the whole biosphere and a theory of cybersemiotics (Brier, 2008a), which would further include a theory of information systems composed of a biological, a psychological and a social autopoietic system (Luhmann, 1990, 1995).

Biosemiotics (bios=life & semion=sign) is a growing field that studies the production, action and interpretation of signs, such as sounds, objects, smells, movements but also signs on molecular scales in an attempt to integrate the findings of biology and semiotics to form a new view of life and meaning as immanent features of the natural world. Life and genuine semiosis are seen as co-existing. The biology of recognition, memory, categorization, mimicry, learning and communication are of interest to biosemiotic researchers, together with the analysis of the application of the tools and notions of semiotics such as interpretation, semiosis, types of sign and meaning. The biosemiotic doctrine accepts non-conscious-intentional signs in humans, non-intentional signs, between animals as well as between animals and humans, and signs between organs and cells in the body and between cells in the body or in nature. Thus the biological processes between and within animals transcend the conceptual foundation of the other natural sciences. Many biosemioticians base their research on parts of Peirce's semiotics (Brier, 2009).

There has been a well-known debate about the concepts of primary and secondary modeling systems (see e.g. Sebeok & Danesi, 2000) in linguistics that has now been changed by biosemiotics. Originally language was seen as the primary modeling system, with culture being secondary to language. But through biosemiotics Sebeok has argued that there exists a zoösemiotic system as the foundation of human language, which has to be called the primary one, thus language becomes the secondary, and culture the tertiary system. It is based on a different view of coding than the structuralist and computationalist coding.

The Biosemiotic Concept of Code

A code is a set of transformation rules whereby messages are converted from one form of representation to another like in cryptography or Morse code. Thus, code refers very broadly to everything of a more systematic nature – "rules" – that the source and the receiver must know *a priori* about a sign for it to correlate processes and structures between two different areas, as for instance the Morse code. But now the term code is also introduced at the level of cells because a more local concept of connecting order than universal laws was needed. The advantage of using the concept of code instead of law is that codes in contrast to universal laws only work in specific contexts, and interpretation is based on more or less conventional rules be they cultural or (here is the extension) biological, such as the DNA-code.

In the protein production system of the living cell the genome in the nucleus, the RNA molecules which goes in and out of the nucleus and is attached to the Ribosomes outside the nucleus membrane triplet can be viewed as translating genes to messenger RNA-molecules, which are then read by the Ribosome as a code for amino acids to string together in a specific sequence to make a specific protein. The cell then interprets this code of life into a three-dimensional protein that can do specific work in the environment provided by the cell, tissue or whole multicellular body. Thus Sebeok (1992) writes of the genetic code as well as of the metabolic, the neural and the verbal code. Living systems are self-organized not only on the basis of natural laws but also on codes developed in the course of evolution. The overall code will contain sub-codes grouped in hierarchies. To view something as encoded is to interpret it as-*sign*-ment (Sebeok, 1992). Thus, in most biosemiotics the concept of code is always connected to meaningful semiosis though not in Barbieri's code-semiotics (Barbieri, 2001, 2008, 2011) nor in information science. Information science is built "bottom up" and is not based on concepts of meaning and interpretation.

A symbol in Peircean semiotics is a sign where the code is conventionally and arbitrarily defined. It can be a word in common language, but gestures and things like flags, presidents, and specific events like a soccer match can be symbols (here for example of national pride). Biosemioticians claim that the concept of symbol goes beyond cultures, as some animals have signs that are "shifters". This points to the fact that their meaning changes with situations, as for instance the feeding behaviour of young adults in the Herring gull. This feeding behavior also appears as a behavioural sequence in the mating game or the head-tossing of the Herring gull, which also occurs both as a pre-coital display but also when the female is begging for food (Sebeok, 1965a).

In this case the interpretant is not the individual but the species or the breeding line. Such a transdisciplinary broadening of the concept of a symbol is a challenging development for many linguists and semioticians working only with human culture and language. For instance Zlatev (2009a, 2009b) works on developing a hierarchy of sign levels.

Life can be understood from a chemical point of view as auto-catalytic, autonomous and autopoietic systems, but that does not say much about how the individual biological self and its awareness appear in the nervous systems. Hormones and transmitters do not function only on a

physical causal basis. Not even the chemical pattern fitting's type of formal causation[12] is enough to explain how sign molecules function, because their effect is conditioned by the temporal, situational and individual context. Sign molecules like hormones and neurotransmitters work also on a basis of final causation supporting a purpose in the survival of the self-organized biological self. As Sebeok (1992) points out, the mutual coding of sign molecules from the nervous system, the hormone system and the immune system is an important part of the self-organizing of a biological self, which again is in constant recursive interaction with its *Umwelt* (Uexküll, 1934).

From a Peircian worldview, nerve cell communication becomes the means of binding the physical efficient causation described through the concept of energy (Firstness) and the chemical formal causation described through the concept of information (Secondness) with the final causations in biological systems described through the concept of semiosis (Thirdness) (Brier, 2008a).

From a cybersemiotic point of view, information science's bit or basic difference is only a sign if it is "a difference that makes a difference", which at least demands the individuality of an autopoietic system. Bits working in the computer for the computer are not signs in themselves because they do not need living systems with final causation to interpret them. They work through formal causation that is the interaction through differences and patterns. The computer is a machine driven only by differences.

A cybersemiotics based on Peirce's triadic sign, views digital information and bits merely as pre- or quasi-signs in themselves (Nöth, 2001, 2002, 2008). Codes inside a computer used by the computer is viewed as proto-sign as they are dyadic and do not require a self-organized "quasi-mind or self" to have causal effect, but work like a key in a lock. However, when we see them as encoding for language in a word processor program, they become signs to us.

Sign making is thus immanent in nature, but manifest in full triadic semiosis only within living systems. Damasio (1994, p. 128) writes that "nature appears to have built the apparatus of rationality not just on top of the apparatus of biological regulation, but also *from* it and *with* it." and dovetails with Peirce' (1921-35) much earlier thinking on this subject. Mind cannot exist or operate at all without a body, as Merleau-Ponty emphasized. The Cartesian model of a world of pure thought is not a viable foundation for the understanding of human rationality. But something more – exactly what still seems to escape us – is necessary to produce minds, imagery and emotions. Damasio (1994, p. 89) writes:

> Brains can have many intervening steps in the circuits mediating between stimulus and response, and still have no mind, if they do not meet an essential condition: the ability to display images internally and to order those images in a process called thought.

Damasio puts forward an interesting theory of 'somatic markers' according to which "dispositional representations" set off chains of reaction that reach deep down into the body's accumulated experience and bring forth images of appropriate visceral content intermingled with emotional states. In turn, these states colour everything with moods that regulate our attention and interest. It is a fecund insight, which was already present in the work of Konrad Lorenz

[12] As Aristotle called it.

(1970-1971, see Brier 1980, 1999, 2000, 2001), and his attempt to build the biological behavioural science of ethology. But still, neither Lorenz nor Damasio reveal how the body may produce experience as such. The most rudimentary biological cognitive processes of animals with perceptual organs involve the ability to make distinctions.

Any type of distinction must be able to sort differences that do not make a difference from differences that do in matters of life and death (Bateson, 1972). Thus the organic is not deterministic or even probabilistic. It is an autopoietic, organizational closed individual (Maturana & Varela, 1980, 1986) that is able to respond to disturbances in a cybernetic internal productive way for survival. As such the life sciences are qualitatively different from the exact science like physics and chemistry and have to be represented by their own arm in the cybersemiotic star.

Molecular biology and genetics in themselves do not explain the nature and quality of life and how the experiential qualities of living systems come about. All we know is that the computational systems we have built so far are unable to produce an experiential world. Haikonen (2009) gives a convincing analysis of the huge problem that the phenomenon of qualia poses for the design of conscious machines (see also his book on conscious machines: Haikonen, 2008).

In the literature on biological systems it has long been assumed that the use of the terms “difference”, “information”, “message”", “signal”, “communication”, “messenger”, “message”, "cue", "code”, “sign” and “meaning” was just a practical and metaphorical shorthand form; but if so, why do these terms persist and proliferate in scientific articles? One of the starting points of a biosemiotics is to take this “information talk” seriously and develop these terms into a common framework (El-Hani, Queiroz & Emmeche, 2006, 2009). The so-called central dogma in biology postulates a unidirectional flow of “information” from DNA to protein. Many scientists hoped that these terms would be effectively reduced to chemical and physical interactions, or at least viewed as computational physical informational processes. In biosemiotics, some of these phenomena are instead evaluated as embodying meaningful sign processes because genetic and biochemical information has been shown to be highly context and time dependent.

This means that “information” in biological systems is not simple objective “data”, but has to be interpreted in a situated context by the cellular or multi-cellular system in order to yield meaning. The simplest form of such semiotic process is not only the ability of single cells to categorize environmental objects from superficial properties, but also internal exchanges between organelles. E. Coli, e.g., is able to recognize carbohydrates by an active site on the macromolecule. Thus the active site stands as a code for the whole carbohydrate molecule. This makes it possible for the same kind of active site on another type of molecule, e.g. artificial sweeteners, to fool the bacteria, just like human beings are fooled by sweeteners in their unhealthy hunt for sugar. The creative capacity of molecular-biological codes to be interpreted in meaningful ways expresses a generative capacity that is beyond the terminology of the molecular-biological language. This example also shows that even at this level of life, a sign is what makes lying possible, as a sign stands for something for someone even though what it stands for need not be present.

We have here a new level of freedom, indeterminism and risk where context of living becomes vital for interpreting and survival. There is no meaning without a life context and no context determined without meaning. They are bound together by a cybernetic semiotic loop. As the organism responds to more of the present situation, it reaches deep into the future and the past as well into its own construction of its 'signification sphere'.[13] As these forms of anticipation unfold, variation, plasticity, versatility, and adaptability grow, and semiotic freedom emerges (Hoffmeyer, 2008) in the form of the enhanced ability to engender new concepts and cognitions that go beyond the genetically determined forms of perception in reflexes and instincts.

The basic reason for developing a biosemiotics is therefore the ontological postulate that biology is already semiotic. The living world is literally full of organic codes (Barbieri, 2001) – such as DNA, messenger and transport RNA, ribosomal RNA codes, hormones, transmitters, immunological codes and so on – and they are associated with all great events of macroevolution from the origin of proteins all the way up to the origin of embryos, the origin of mind and the origin of language Barbieri (2006). Not only does life create these semiotic capacities, it creates the capacity to create new codes with new semiotic capacities (Barbieri, 2011). Codes and signs cross the old borders between nature and culture, between causality and signification, and between interaction and communication. Biosemiotics suggests developing a reflected semiotic theory of the origin of life, agency, modeling, coding, semiosis, sense perception, conscious awareness and communication. But it is seldom truly Peircean. Kull, Deacon, Emmeche, Hoffmeyer & Stjernfelt (2010, p. 1) write about developing a biosemiotics from this viewpoint:

> Theses on the semiotic study …provide a collectively formulated set of statements on what biology needs to be focused on in order to describe life as a process based on semiosis, or sign action. An aim of the biosemiotic approach is to explain how life evolves through all varieties of forms of communication and signification (including cellular adaptive behavior, animal communication, and human intellect) and to provide tools for grounding sign theories.

Thus, in the biosemiotic paradigm the primary unit of biosemiotic research is the *sign*, not the quark, atom or molecule. What counts as true in research is not simply given. Knowledge of facts presupposes knowledge of theories (categorizations) and of values, just as knowledge of theories and values presupposes knowledge of facts. Inquiry is never disinterested, questions of what and how and why are always intertwined. There are objective and reasonable standards that are independent of any specific human interest, but none are independent of human interest in general. Laying out principles of practical reasoning and showing how it's universal and context dependent components work together is the proper task of pragmaticism and was central to Peirce's (1931-1958) endeavors. Let us therefore go a little further into that by exploring the foundation for the cybersemiotic version of Wissenschaft.

The Peircean Semiotic Worldview

A sign – in its broadest Peircean definition – is then: *Anything that stands for something for somebody in some respect or capacity in certain situations in a certain way*. A sign – or a

[13] This is a concept of cybersemiotics to signify the Peircean reinterpretation of Jacob von Uexküll's concept of the animal's "Umwelt", see Brier (1995, 2011).

Representamen – is a medium for the communication of a form in a triadic relation. The Representamen refers to its Object, which determines it and to its Interpretant, without being itself affected. The Interpretant is the interpretation in form of a more developed sign in the mind of the interpreting receiving mind or quasi mind. For an Interpretant, a Representamen could be for example a moving hand that refers to an Object (the process of waving). This is the interpretation in my mind materializing as the more developed sign 'waving', which is a cultural convention and therefore a symbol. All kinds of alphabets are composed of signs.

As Kultgen (1959-1960) argued, it is important to note that both Peirce (ibid) and the process philosopher Whitehead (1929) deny Kant's (1990 [1981]) absolute distinction between nature and freedom, replacing it by a sort of process philosophy. To Peirce, nature has spontaneity and pure chance at its basis in Firstness and it has reasonability in what Peirce calls the category of Thirdness. It is an alternative to a mechanical deterministic view as in classical physics. Peirce denies Kant's distinction between the phenomenological and the noumenal, understood as the thing in itself, because this idea of the incognizable appears as a null-term of theoretical and practical thought. To Peirce, the real is fully open to our pragmatic observation and thinking and there is no absolute difference between objects of theoretical and practical thought. Metaphysics is seen as an ideal limit of empirical enquiry (Kultgen, 1959-1960, p. 288). Thus Peirce makes a full naturalization of all possible kinds of knowing in the universe, including the subject and the intersubjective phenomena.

Peirce does not describe another world of thought or mind from the material[14]; only the one we are in when having experiences. Thus his view is compatible with Hans Fink's (2006) suggestion of a new ontology, which he calls an *unrestricted* or *absolute naturalism*. Fink has developed this philosophy from important points in McDowell's (1998) book *Mind, value and reality*. His view takes the philosophical consequence of the realization that all things and phenomena are developed within the universe in accordance with the evolutionary world view. Therefore we do not see culture, mind, meaning, consciousness and ethics to be outside nature. They are all natural phenomena inside nature, which concurs with Merleau-Ponty's position (see above). What else can they be, when we do not work with an absolute dualism or any other systems that propose more or less invisible worlds outside nature?

This is a philosophical move taken also by modern American philosophers like Sellars, McDowell (1996) and Brandom[15]. Peirce was a great inspiration to Sellers. Like Peirce, Sellers wanted to replace the Humean version of analytic philosophy by a Kantian-inspired version. It is a move beyond classical empiricism and naturalism or from logical empiricism to logical Kantianism. Peirce, like Sellars, thought the task of philosophy was to provide a 'synoptic' view of how things fit together in the broadest possible sense of that term. How does our common sense outlook fit into our increasingly fine-grained scientific outlook? For example, how can we make our perception of a blue wall compatible with the same phenomenon described by particle physics?

[14] Like Husserl, Peirce was not a dualist, and therefore did not work with a framework where the distinction between "inside" and "outside" was primary.

[15] Robert Brandom (1994) recently declared that Wilfrid Sellars is the greatest American philosopher ever since Charles Sanders Peirce: http://www.ditext.com/brandom/brandom.html.

Both Peirce and Sellars saw our non-scientific ways of thinking as a prerequisite not only for knowledge but as the very basis for perception and thought. The problem is that empiricist philosophy says that our ideas come from the direct experience of things. The 'myth of the given' – as Sellers' pointed out – is the claim that individual pieces of data can be known directly, that is, without any knowledge of associated concepts.

Peirce's view is consistent with Sellars', but he develops his explanation in the form of his three categories calling empirical observations grounded in Secondness, which only makes sense when interpreted through Thirdness. The problem is: how can I say I know what *red* is from the fact that some things look red to me? According to both Peirce and Sellers, in order to say anything 'looks blue' we would require the abstract universal concept of 'is blue', i.e. a concept that is not only connected to the concrete experience or things. It is a basic philosophy as well as philosophy of empirical science problem that we need universal concepts to distinguish one color from other colors, or one taste from another. This means that the model of the world out there, which empirically based science produces, lacks an integrated reflection on just that cognitive structure within our embodied mind that produced the science.

Instead, being in the world, in language, embodied in a meaningful social context, we have to start 'in medias res' (centre of the cybersemiotic star). We will always be bound to make some metaphysical presumptions based on our present understanding, and they will always turn out to be too limited. But Peirce's semiotics is a solid non-reductionist framework to start from since it takes its point of departure in the semiotic mind.

Today, it is widely recognized that what we call a human being is a conscious social being living in language. In his book *The symbolic species*, Terrance Deacon (1997), sees man's language-processing capacity as a major selective force for the human brain in the early stages of human evolution. We speak a language, but we are also spoken about by language. To a great degree, language carries our cultures as well as our theories of the world and of ourselves. As individuals, we are programmed with language or what we normally call *socialized* or *acculturated* to learn a language is to learn a culture (Durst-Andersen, 2011). As such, pre-linguistic children are only potentially human, as they have to be linguistically programmed in order to become the linguistic animal cyborgs we call human. However, getting behind language as such is difficult without creating a broader platform beyond linguistics. Peircean semiotics and its modern evolution into a biosemiotics is the attempt to build such a doctrine of cognition and communication based on the concept of knowledge in its widest sense.

The conclusion is that we live in a world of signs (the centre of the cybersemiotic star model) where objects appear when we are disturbed by certain differences or 'Secondnesses' – as Peirce calls them – and interpret them by connecting a representamen (a primary sign) with an object into an interpretant in our mind. Some of the objects, which our embodied cognitive experiences show us, turn out to be things.

Scholastic Realism: A Third Way Beyond Empiricism and Constructivism

Thus, the first impression (immediate objects) is obtained through perceptual experiences and communications with other semiotics beings. This semiotic object is then modified to a truer

picture of things and processes, Peirce' so-called *dynamic objects*, of which some turn out to be things. Although Peirce may appear as a bio-psycho-social constructivist, he is in fact a dynamic realist who believes in universals, and certainly not neither a physicalist nor an idealist. He calls his stance "scholastic realism" inspired by Duns Scotus (1266 – 1308), but adds the important aspect of evolution (Boler, 1963) to the view of the scholastic thinkers. Peirce thus places his doctrine of signs somewhere between Plato and Aristotle, supplementing it with an evolutionary worldview. Susan Haack (1992, pp. 22-23) explains the point very well:

> Though what exists is real, what is real may not exist; existence is reaction, interaction – the characteristic mode of being of particulars, of seconds. This is why Peirce made a distinction between scholastic realism and what he called "nominalistic Platonism" [see CP 5.503 (c.1905); 5.470 (1903); 5.503 (c.1905)]: the thesis that universals like "man" or "horses" refer to abstract particulars, to existents. Peirce objected to nominalism and conceptualism because they deny that generals are real; he objected to nominalistic Platonism because it asserts that generals exist. Peirce's position was that there are real generals, not that generals are real.

Thus Peirce's view of reality is not at all some sort of dualistic mathematical combination of a modern physicalistic view and Platonism. *The real in Peirce's paradigm is not only external things, but also concepts!* Existence is Secondness and the food for empirically based knowing. Yet Peirce does not doubt that the external is real. The existent is that which reacts against other things. The external world does not consist merely of existent objects and their reactions, since Peirce includes words, signs, general types and would-bes into what is real. Peirce (CP 8.191) writes:

> Thus, for example, the real becomes that which is such as it is regardless of what you or I or any of our folks may think it to be. The external becomes that element which is such as it is regardless of what somebody thinks, feels, or does, whether about that external object or about anything else. Accordingly, the external is necessarily real, while the real may or may not be external; nor is anything absolutely external nor absolutely devoid of externality. Every assertory proposition refers to something external, and even a dream withstands us sufficiently for one description to be true of it and another not. The existent is that which reacts against other things. Consequently, the external world (that is, the world that is comparatively external) does not consist of existent objects merely, nor merely of these and their reactions; but on the contrary, its most important reals have the mode of being of what the nominalist calls "mere" words, that is, general types and would-bes.

A would-be in Peirce's paradigm is something pointing to some kind of habitual existence in the future. If we say that a knife 'is sharp', after having cut ourselves on its blade, it means that it is likely to have that property in the future, too. Peirce (CP 8.216) sums up: "I must show that the *will be's*, the actually *is's*, and the *have been's* are not the sum of the reals. They only cover actuality. There are besides *would be's* and *can be's* that are real."

Peirce's view is a fascinating attack on naive empiricist physicalism without an arrow of time and concept of irreversibility. Peirce's realism is, among other things, based on his belief in Secondness, or the unexplainable or random event, which is still not a fact. There are immediate differences and resistances between phenomena or different things, which he calls haecceities.

This is the concept Duns Scotus argued for as an original principle of individuation. He saw haecceity as the ultimate unity of a unique individual (an entity's 'thisness') as opposed to the common nature (*natura communis*), which denotes features existing in any number of individuals. Peirce (CP 1.405) writes about this fundamental concept of secondness in his phaneroscopic semiotics:

> Most systems of philosophy maintain certain facts or principles as ultimate. In truth, any fact is in one sense ultimate – that is to say, in its isolated aggressive stubbornness and individual reality. What Scotus calls the haecceities of things, the hereness and nowness of them, are indeed ultimate. Why this which is here is such as it is; how, for instance, if it happens to be a grain of sand, it came to be so small and so hard, we can ask; we can also ask how it got carried here; but the explanation in this case merely carries us back to the fact that it was once in some other place, where similar things might naturally be expected to be. Why IT, independently of its general characters, comes to have any definite place in the world is not a question to be asked; it is simply an ultimate fact. There is also another class of facts of which it is not reasonable to expect an explanation, namely, facts of indeterminacy or variety. Why one definite kind of event is frequent and another rare, is a question to be asked, but a reason for the general fact that of events some kinds are common and some rare, it would be unfair to demand. If all births took place on a given day of the week, or if there were always more on Sundays than on Mondays that would be a fact to be accounted for, but that they happen in about equal proportions on all the days requires no particular explanation. If we were to find that all the grains of sand on a certain beach separated themselves into two or more sharply discrete classes, as spherical and cubical ones, there would be something to be explained, but that they are of various sizes and shapes, of no definable character, can only be referred to the general manifoldness of nature. Indeterminacy, then, or pure firstness, and haecceity, or pure secondness, are facts not calling for and not capable of explanation. Indeterminacy affords us nothing to ask a question about; haecceity is the ultima ratio, the brutal fact that will not be questioned.

Peirce adopts Duns Scotus's term *haecceity* to designate the arbitrary here-and-now-ness of existence, a person or object's “this-ness”, that is, the brutal facts based on relations. Peirce identifies this haecceity as 'pure secondness'. His view of haecceities as being unexplainable as singular events is close to the modern understanding of quantum events. Quantum physics cannot deduce the singular event; it can only make a probability model from thousands of them. There is an undetermined spontaneity – which Peirce calls Firstness – of which the manifestation of the single event (as Secondness) is not explainable in itself from a scientific point of view. Only through Thirdness using a statistical model can we predict further outcomes over a series of events. Quantum mechanics breaks with classical deterministic mechanicism and realizes that it has to base its laws on probability or on what Peirce from his propensity theory of probability calls ‘habits’. This is an alternative concept to the concept of an absolute and universal law in mechanical determinism.

In my view any theory of information connected to perception and communication must incorporate the original grounding of knowing in both the subjective and intersubjective semiosis of perception and emotion. Furthermore, physicalism encounters a rather fundamental problem in explaining how we can decide to move our bodies out of mere intentions or experiences (such as pain or pleasure). As such they fail to reveal anything approaching the deep connection between

mind and matter. Yet, Daniel Dennett (1987a, p. 5), in his introduction to *The Intentional Stance,* states: "I declare my starting point to be the objective, materialistic, third-person world of the physical sciences." He attempts to eliminate subjective consciousness and the qualia of consciousness in his *Consciousness Explained* (Dennett 1991). He then attempts to explain 'subjective' phenomena in 'objective' terms. As far as I can see, none of these endeavours are feasible, since the language of physics does not include the notion of agent (agency) and meaning. It cannot capture the meaningfulness of semiosis, language and interpretation, as it is theorized to a full practical and philosophical foundation, for instance, by Hans-Georg Gadamer, who builds on Heidegger's hermeneutic re-interpretation of Husserl's phenomenology (Gadamer, 2004). Therefore physicalism and objective informationalism cannot be the foundation of a unified science.

Dennett contrasts his approach with that of Thomas Nagel, who views objectivity as the "view from nowhere" (Nagel, 1986), incapable of acknowledging the particular points of view of individual sentient creatures. In his famous paper 'What is it like to be a bat?' Nagel (1979) forcefully argues that scientific, third person, objective methods could never fully explain consciousness. I agree with Nagel in that Dennett fails to explain the objective fact of sentience and to appreciate the significance of subjectivity. He neglects subjectivity as well as the meaningfulness produced through inter-subjectivity. And yet the psychological and social aspects of reality are the prerequisites for collective and empirically based knowledge systems, on which the physical sciences rest. One cannot forget the observer when attempting to adopt a transdisciplinary and universal perspective (Nicolescu, 2002). Anyway we must realize that our presence here already limits the possible range of the physical constants upholding space-time. As conscious being existing embodied within a universe, we realize by reflection that we are bound to observe only those physical phenomena, which are compatible with the evolution of intelligent and conscious life such as ours. If not we would not be here observing. In the modern theory of multiverses (Carr, 2007) the possibility is opened for the existence of millions of other universes, which we cannot observe, because we could not survive in them or observe them from the outside, as any observer needs a universe to sustain him/ her. But it still does not explain consciousness as a derived principle from the evolution of physical systems.

This is the problem that pan-computational and pan-informational theories attempt to solve with a view of the world as a grand computer and a new concept of natural computing (Dodig-Crnkovic, 2010; Dodig-Crnkovic & Müller, 2011). Given these assumptions the view of natural computing can be expressed in this way:

1. The physical world is a network of computational processes with many levels of organization.
2. Whatever changes there are in the states of the physical world, we understand them as computation.
3. Not all kinds of computations (changes in the physical world) are best represented by the Turing model.

In my view, it is not information that is transmitted through the channel in Shannon's theory, but signals. There is a sender and a receiver of these signals. The sender's meaning must be interpreted by the receiver outside the transmission itself, because meaning is psycho-biologically embodied, socially embedded and enacted through language. In order for interpretation to take place, both sender and receiver must have something in common, at least a code of meaningful

interpretation, otherwise they will not understand each other. Thus the signal is actually an interpretable sign. To have a sign game in common usually implies having roughly the same kind of consciousness and body, which, in the case of a full-blown human natural language communication or a Wittgensteinian language game, needs to be embedded in a culture equipped with a worldview and an anthropology. Thus logic and understanding are two different sides of meaning. One has to learn about the culture and its mentality if one wants to understand any language.

We must further theorize how the processes of cognition and communication develop beyond their basis in the perturbation of and between closed systems and into a theory of feeling, awareness, qualia and meaning. But even quantum field theory's spontaneous observer-independent field activity offers no help to emergence theories, even when quantum field theory is combined with an information science approach that sees information as objective structural differences in matter or between parts of matter. This ontological foundation does not solve the problem of how experience and meaningful cognition and communication emerge or manifest themselves in the world. This viewpoint leads us towards Peirce's semiotics as a better foundation than a pan-computation paradigm to help us place experiential consciousness in a scientific worldview.

Peirce's phaneroscopic and semiotic foundation of qualia is laid down most clearly in the following quote, which warrants careful study:

> No thought in itself, then, no feeling in itself, contains any others, but is absolutely simple and unanalyzable; and to say that it is composed of other thoughts and feelings, is like saying that a movement upon a straight line is composed of the two movements of which it is the resultant; that is to say, it is a metaphor, or fiction, parallel to the truth. …Whatever is wholly incomparable with anything else is wholly inexplicable, because explanation consists in bringing things under general laws or under natural classes. Hence every thought, in so far as it is a feeling of a peculiar sort, is simply an ultimate, inexplicable fact. Yet this does not conflict with my postulate that that fact should be allowed to stand as inexplicable; for, on the one hand, we never can think, "This is present to me," since, before we have time to make the reflection, the sensation is past, and, on the other hand, when once past, we can never bring back the quality of the feeling as it was in and for itself, or know what it was like in itself, or even discover the existence of this quality except by a corollary from our general theory of ourselves, and then not in its idiosyncrasy, but only as something present. But, as something present, feelings are all alike and require no explanation, since they contain only what is universal… Finally, no present actual thought (which is a mere feeling) has any meaning, any intellectual value; for this lies not in what is actually thought, but in what this thought may be connected with in representation by subsequent thoughts; so that the meaning of a thought is altogether something virtual. … At no one instant in my state of mind is there cognition or representation, but in the relation of my states of mind at different instants there is. In short, the Immediate (and therefore in itself unsusceptible of mediation – the Unanalyzable, the Inexplicable, the Unintellectual) runs in a continuous stream through our lives; it is the sum total of consciousness, whose mediation, which is the continuity of it, is brought about by a real effective force behind consciousness. (Peirce, CP 5.289)

It is the subjectively and inter-subjectively shared first person experiential consciousness, as its own first cause, that Peirce considers the basis of his semiotically based pragmaticist philosophy. Thus when a specific feeling or perceptual experience appears in our consciousness as something (Secondness); this Secondness is compared with another in the present or in the past (memory), thus giving rise to a Thirdness of symbolic signs, and hence language. In Peirce's semiotics, Thirdness mediates between Secondness and the Firstness of pure feeling, process and possibility, and thus gives rise to the gradual emergence over time of signs and cognitive categories in our cultural and linguistic intersubjectivity.

Let us then sum up the differences between a semiological and a semiotic view by relating each of the two to nine different examples of signs. A sign stands for something for somebody in some aspect:

- As the word 'blue' stands for a certain range of color, but also has come to stand for an emotional state.
- As the flag is a sign for the nation (a symbol).
- As a shaken fist can be a sign of anger.
- As the red spots on the skin can be a sign of German measles (Rubella).
- As the wagging of a dog's tail can be a sign of friendliness towards both dogs and humans.
- As pheromones can be a sign of heat to the other gender of the species.
- As the hormone oxytocine from the pituitary can be a sign to the cells in lactating glands of the breast to release milk.

Semiologians would usually not accept examples 4-6 as genuine signs, because they are not self-conscious and intentional human acts of communication. But Peirce's triadic, pragmaticist, transdisciplinary, evolutionary doctrine of signs accepts not only non-consciously intentional signs in humans and between animals (ex. 5 and 6) as well as between animals and humans (ex. 5), but also non-intentional signs (ex. 4), and signs between organs and cells in the body (ex. 7) in endosemiotics as for instance as *immunosemiotics* dealing with the immunological code, immunological memory and recognition.

The biosemiotic view is well summarized in Jesper Hoffmeyer's books (Hoffmeyer, 1996, 2008) and Donald Favareau's (2010) collection of "Essential readings in biosemiotics" and as part of Brier (2008). In an interview discussing the choice between Saussurian/ Greimassian dualistic semiology and Peircean triadic semiotics, Petrilli and Ponzio (2008, sections 37-38) give convincing arguments for choosing Peirce's semiotics:

> We believe that the scope of semiotic enquiry must transcend the opposition between semioticians oriented in a Saussurean/ Hjelmslevian/ Greimassian sense and semioticians oriented in a Peircean sense. These two trends seem to require that we oppose binarism to triadism. On the contrary, we believe that the heart of the matter does not lie in the opposition between binarism and triadism, but in the opposition between a sign model that tends to oversimplify things with respect to the complex process of semiosis and a sign model (like Peirce's) that seems to do more justice to the various aspects and factors of the process by which something is a sign. This is not merely achieved on the basis of an empty triadic form, but rather thanks to the specific contents of Peirce's triadism. In other words

> Peirce's triadism works thanks to the categories it uses, the sign typology it proposes, the dynamic model it offers when it describes signs as grounded in *renvoi* from one interpretant to another. Such triadic categories as "firstness," "secondness," and "thirdness," "representamen," "interpretant," and "object," "symbolicity," "indexicality," and "iconicity," all evidence the alterity and dialogism constitutive of signs from a semiotic perspective. The merit does not go to the triadic formula. Proof for this is offered by Hegelian dialectics where triadism gives rise to metaphysical, abstract and monological dialectics abstracted from the constitutive dialogism in the life of signs.

Many researchers, among them Karl-Otto Apel (1981)[16] and Jürgen Habermas (1987, with a somewhat strange interpretation)[17], have been attracted by Peirce's radically new way of thinking, and it has made a great impression on what became the Copenhagen School of biosemiotics and its members Jesper Hoffmeyer, Claus Emmeche, Frederik Stjernfelt and Søren Brier and its relation to the Tartu school of semiotics through Kalevi Kull and Timo Maran. It is this modern development of Peircean semiotics into biosemiotics that I want to integrate with Luhmann's triple-autopoietic view of socio-communication.

The Luhmanian Aspect

As mentioned above, Luhmann extended the autopoietic model to the psychological as well as the socio-communicative level. Luhmann (1995) proposes a triple autopoiesis model consisting of three systems: the biological and psychic systems, which are silent, and the 'socio-communicative' system, which is the only one that can communicate. Biological autopoiesis

[16] From the book cover I quote this precise characterization: "As a mediation between theory and praxis, Apel presents pragmatism as the major rival to both existentialism and Marxism, the two other responses to the Hegelian aftermath. In the same context, Apel demonstrates the importance of Peirce's conceptual breakthroughs, in the theory of signs (semiotics) and the theory of rationality, for the challenges and possibilities of a critical theory of society."

[17] Habermas (1987) observes that the insight helping Peirce avoiding positivism was "his understanding that the task of methodology is not to clarify the logical structure of scientific theories but the logic of the procedure with whose aid we obtain scientific theories". But Habermas believes that Peirce does not go far enough to be able to overcome the correspondence theory of truth completely. He ultimately succumbs to the same objectivist illusion because of his contradictory notion that the uncompelled consensus among inquirers aims at technical control. Habermas (1987, p. 137) writes:

> The symbolic representation of matters of fact knowable from the transcendental perspective of possible technical control serves exclusively for the transformation of expression in process of reasoning. Deduction, induction, and abduction establish relations between statements that are in principle monologic. It is possible to think in syllogism, but not to conduct a dialogue in them. I can use syllogistic reasoning to yield arguments for a discussion, but I cannot argue syllogistically with another. Insofar as the employment of symbols is constitutive for the behavioural system of instrumental action, the use of language involved is monologic. But the communication of investigators requires the use of language that is not confined to limits of technical control over objectified natural process. It arises from symbolic interaction between societal subjects who reciprocally know and recognise each other as unmistakeable individuals. This communicative action is a system of reference that cannot be reduced to the framework of instrumental action.

Habermas does indeed develop this area of dialogical communicative ethics substantially, but fails to see that Peirce's semiotics is based on a dialogic conception of mind, which is why there is actually no contradiction between the theoretical foundation of his and Peirce's work.

functions in the medium of life and psychic, and socio-communicative autopoiesis functions in the medium of meaning. Figure 2 illustrates how Luhmann's three autopoietic systems combine in human cognition and communication:

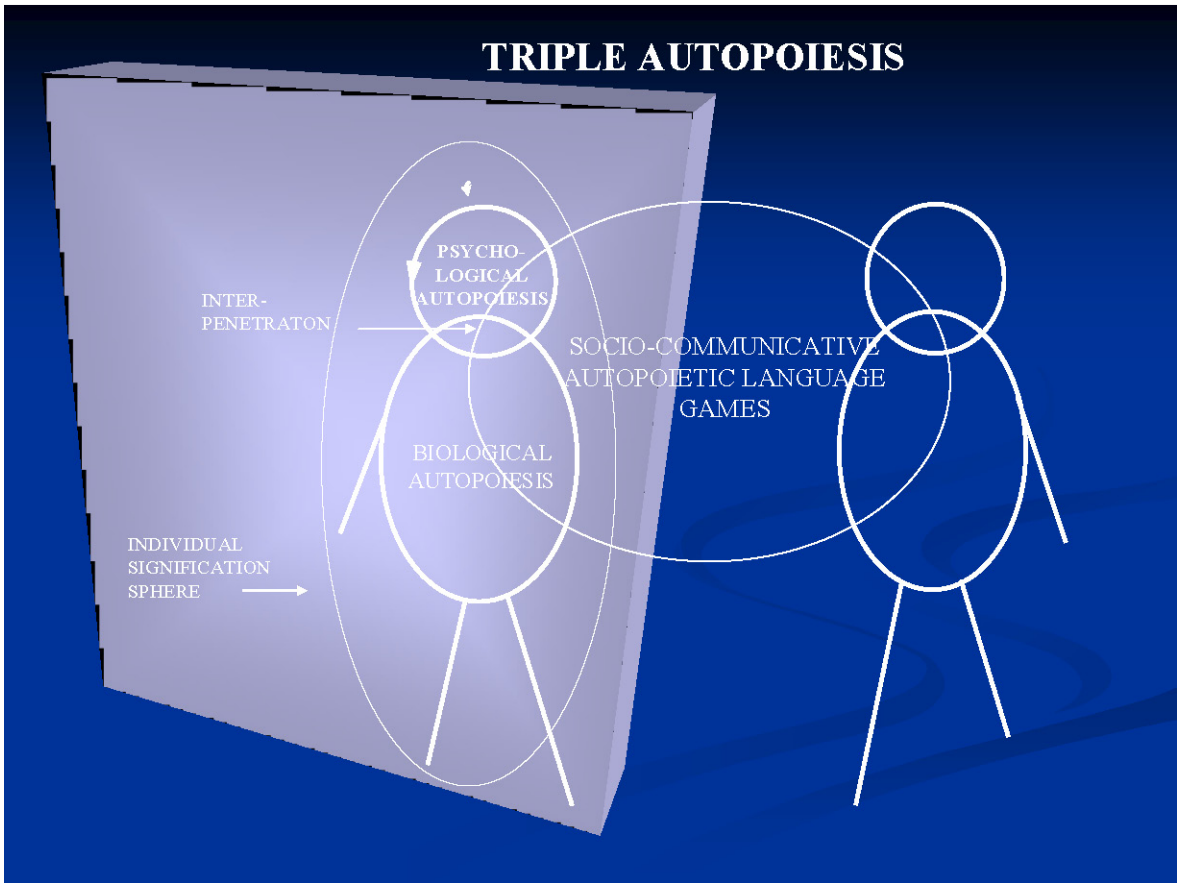

Figure 2: *Three organizationally closed systems working separately make communication possible. This figure is a symbolic iconic picture of Luhmann's basic theory and not a map of where the various systems are placed in the body. Psychological processes for example are not only in the head, but the head is used to symbolize the mind. The signification sphere is the biosemiotic term for von Uexküll's "Umwelt" and Maturana's (1988a, 1988b) "cognitive domain". This model represents the first step towards an integration of Luhmann and Peirce's theories.*

My main problem is where does first person experience belong in this scheme of things? How do systems go from being functionally able to orient themselves in relation to environmental structures and other members of the species to develop sense-organs that actually produce quale sense-experiences? Most of us believe that robots do not have sense experiences. Searle (1989) argues that the secret must lie in biology. As far as we know, biological systems are the only ones to produce nervous systems and central nervous systems that create awareness, feeling, sense-experience and qualia. But biologists insist on describing their subject area in chemical and physiological terms and consider molecular biology to be the greatest advance since Darwin. The vitalism debate has ruled out any differences in the nature of the molecules inside and outside

living systems. Thus, the received view in science is that the only difference between pure physical and living biological systems is the way these inert molecules are organized.

How did the world begin, and how did the first distinction of awareness come about in the universe? The first question is asked in physics and the second in phenomenology. How to integrate those two descriptions is the key problem in the modern world's attempt to create a coherent Wissenschaft worldview. If one then asks the foundational question: What was before the beginning of the big Bang in physics, before the first perception in phenomenology or before the first distinction or in Peircean semiotics before the first semiosis, then one is forced to answer that there is a becoming[18], because a "before" in the ordinary understanding of time is not possible! For Peirce it is a Firstness with a tendency to form habits. Luhmann does not have any answers to give to first philosophies working as he does with second order observations. For him drawing a distinction between the observing system and its environment is the first move.

The becoming aware brings into being the descriptions that lead us to postulate self, environment etc. When becoming becomes aware and begins to make the distinction between one self, the others and the environment, an ontology will necessarily be produced as a prerequisite for the production of meaning in language communication. The concept ontology does not refer to a final and unchangeable, true picture of the world or reality. In Peirce's view an ontology or a metaphysics is a working hypothesis of reality we test and change all the time. Nevertheless it is there all the time.

As human observers we find ourselves in language and therefore in intersubjectivity with other linguistic beings. We do not have to postulate the other(s) after becoming aware of ourselves, because they are prerequisites for our becoming aware as linguistic self-conscious beings. We live in language, so to speak, and take it with us wherever we go. We cannot speak of being without knowing: if we exist but don't know, our existence doesn't matter. When the becoming becomes aware in language it reflects on what it itself is and it realizes that it never becomes aware alone but only as a process embodied in flesh and language with others; this is fundamental to the definition of what it means to be human. Reality in the form of semiotic objects such as the other, language, culture and society, is established in the process of becoming aware.

My view is that you cannot generate knowledge without first accepting the reality of the other, your own body and consciousness, as well as the language you use, and second, being a radical ontological constructivist. The realization of being a part of the becoming makes us accept nature's creativity and potential for signification and intelligence through evolution as a further prerequisite. That is a synechist realism without MIR (mind independent reality)! As soon as we accept the reality of the other and of something out there and therefore language, we move from radical constructivism of the ontological kind into a more epistemological variant much closer to pragmaticism. We will also have to accept that there is some resistance in that with which we interact, be it living or not. This is what Peirce calls Secondness.

[18] As I remember, this idea and concept of becoming appeared to me from individual discussion with Ranulph Glanville and Louis Kauffman about the columns they write to *Cybernetics & Human Knowing* of which I am the editor-in-chief.

But in order to understand anything at all, we need a sort of stability sustaining both that which we perceive and ourselves as embodied perceivers. This stability or habit is what Peirce calls Thirdness. Peirce's claim is that his three categories are the minimal prerequisites for any knowledge process or semiosis to emerge in the world (Murphey, 1961). The field of potential possibilities is what Peirce calls Firstness. When asked what is before linguistic consciousness one will have to answer with Peirce that as soon there is Thirdness there is semiosis and therefore a semiotic awareness. Before that there is the pure feeling and potential qualities as virtual forms of Firstness.

Transdisciplinarity demands the development of such a new and broader framework, which will therefore offend all those researchers who prefer to stay within the received view of their own knowledge or paradigm. To choose Peirce means to accept most of his triadic pragmaticist and realist view of science and his semiotic theory of cognition and communication. What also intrigues me about Peircean semiotic philosophy is that it demonstrates that the use of signs is a two-way street. We use signs to create life worlds or Umwelten as much as we use them to create models of ourselves. Peirce (CP 5.313) writes,

> Man makes the word, and the word means nothing which the man has not made it mean, and that only to some man. But since man can think only by means of words or other external symbols, these might turn round and say: "You mean nothing which we have not taught you, and then only so far as you address some word as the interpretant of your thought." In fact, therefore, men and words reciprocally educate each other; each increase of a man's information involves and is involved by, a corresponding increase of a word's information.

As Peirce (CP 2.222) goes on to conclude, the sign, in particular the symbol, "is a living thing, in a very strict sense that is no mere figure of speech. The body of the symbol changes slowly, but its meaning inevitably grows, incorporates new elements and throws off old ones." Peircean biosemiotics has given a biological reinterpretation of the life phenomenon, which it is possible to integrate with Luhmann's autopoietic system theory.

The Cybersemiotic View of Communication

Thus, what is transferring between us is made up of signs, not information. Signs have to be interpreted, and it has to happen on at least three levels, described by Luhmann's three types of autopoiesis. On the most basic level we have the basic coordination between the bodies as a dance of black boxes to allow for meaningful exchange. This is what Maturana calls languaging. The next level consists of instinctual sign games providing drive and emotionally-based communication about meaningful things in life like mating, hunting, dominating, food seeking, territory etc. They are all well described in the science of ethology, which Lorenz, Tinbergen and von Frisch received the Nobel Prize for developing. Based on these two levels a field of meaning is created that the socio-communicative system can use as a base line to modulate conscious linguistic meaning. This is illustrated in figure 3.

Language games were what the father of modern biosemiotics, Thomas Sebeok, called tertiary modeling. He used the concept of modeling to explain life and behavior among living entities

conceived in terms of semiosis. The concept of modeling is of fundamental importance in Sebeok's semiotic research. He was inspired by the Moscow-Tartu school of semiotics in human communication. But Sebeok extended the concept of modeling biosemiotics at the interface between semiotics and biology (Sebeok & Danesi, 2000) as 'the capacity of a species to produce and comprehend the specific types of models it requires for processing and codifying perceptual input in its own way' (Sebeok & Danesi, 2000).

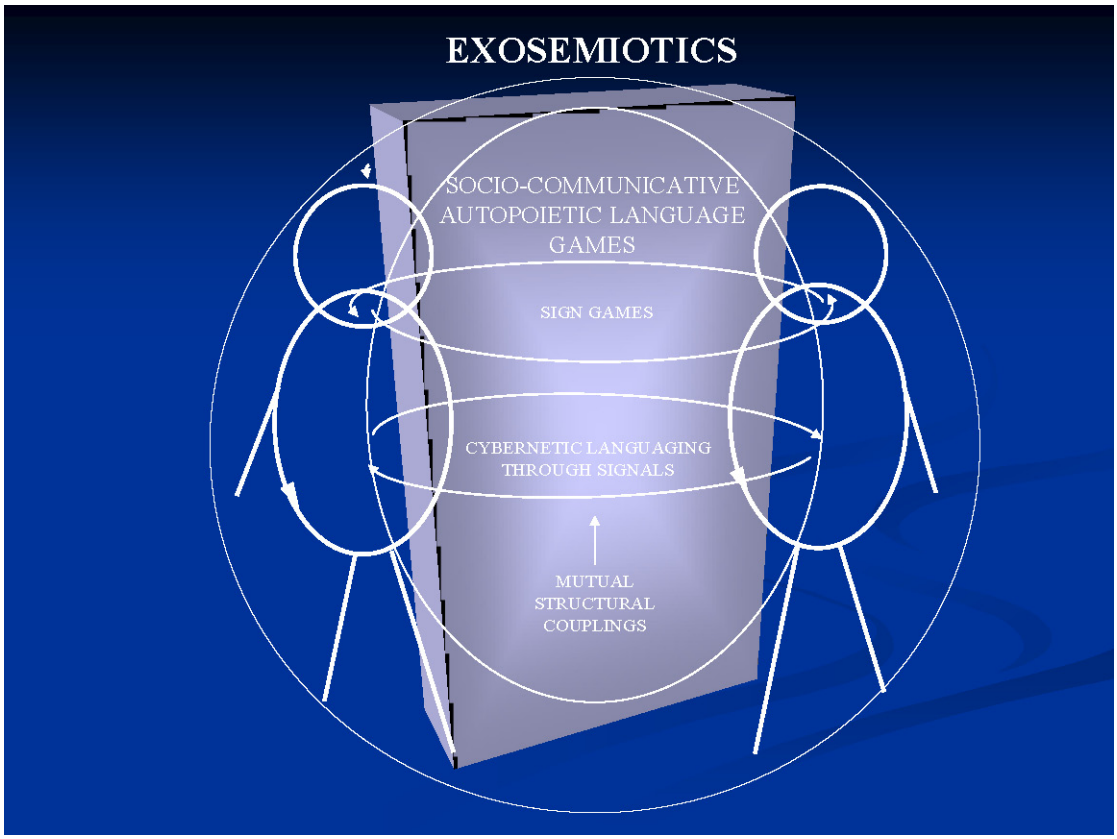

Figure 3 *shows the three different levels of communication systems described in cybersemiotics. At the foundation is the informational exchange of signals of orientation and other reflexes, which Maturana (1988a, 1988b) calls 'languaging'. On the next level we find the ethological (or what below WE will call the biosemiotic) sign games of all living systems mostly within the biologically defined species, which still works for the basic biological drives in humans. Then there is the level of language interchange in dialogue between self-conscious persons, called language games after Wittgenstein's pragmatic language philosophy.*

The primary modeling system is the innate capacity for *simulative* species-specific modeling that Sebeok calls 'language'. This is the species-specific primary modeling system of the human species. The secondary modeling system subtends both 'indicational' and 'extensional' modeling processes, of which the nonverbal form of indicational modeling has been documented in various species. But extensional modeling is a uniquely human capacity in that it presupposes *language* (which Sebeok and Danesi call the primary modeling system) and distinguishes it from *speech* (named the human secondary modeling system). The tertiary modeling system subtends highly

abstract, symbol-based modeling processes. The species-specific system that Sebeok and Danesi call the tertiary modeling systems is the human cultural system.

We also have a system of cognition levels in the organism, as well as an internal system of biosemiotic types of semiosis. Previously, we have dealt with types of exosemiotic behavior. Now, corresponding to the three levels of exosemiosis there are three levels of internal semiosis, plus a fourth interactive one (intra semiotics). I call them 1. linguistic *thought* semiosis, 2. Psychological *pheno*-semiosis, 3. somatic *endosemiosis* and 4. psycho-somatic *intra*-semiosis. Thus, each human agent is an integrated macro-system of internal semiosis, as shown in figure 4.

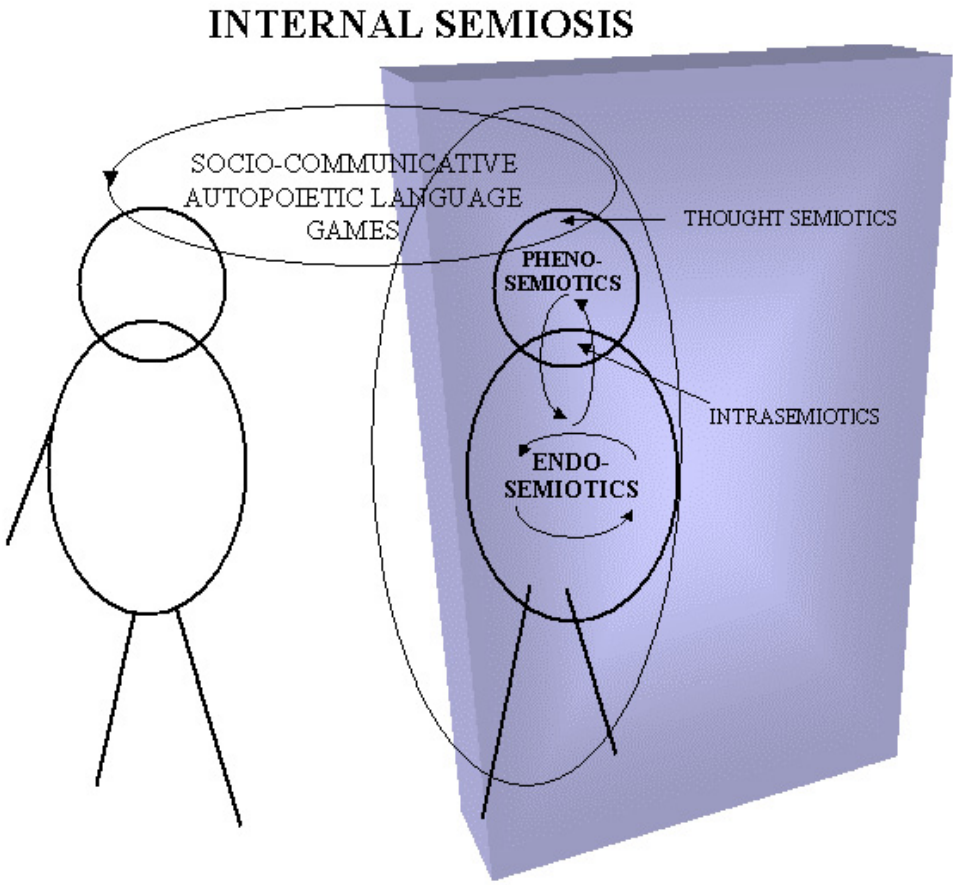

Figure 4: *Internal semiosis. The figure shows in a symbolic way the relationship between endosemiotics and the new areas of phenosemiotics, thought semiotics, and intrasemiotics (quoted from Brier 2006a, p.285; 2008, p. 306).*

The terms endosemiosis and exosemiosis were probably both coined by Sebeok (1976, p. 3), endosemiosis denoting the semiosis that takes place inside the organism, and exosemiosis being the sign process that occurs between organisms. Endosemiosis became a common term in semiotic discourse (see Uexküll et al, 1993) for a semiotic interaction at a purely biological level between cells, tissues and organs.

Today we know that there are semiotic interactions between the hormone system, the transmitter system and the immune system and that their interactions are very important for the

establishment of the autopoietic system of second order constructed by a multicellular organism. This autopoietic system is often called a "biological self". Its parts are cells that are themselves autopoietic systems, which in turn are also organized in an autopoietic system. But we know very little about the relations between this system and our lived inner world of feeling, volitions and intensions. It seems that certain kinds of attention on bodily functions, such as imaging, can create physiological effects in this combined system.

The effect is partly carried by different substances that have a sign effect on organs and specific cell types in the body (endosemiotics). We also know that our hormonal level influences our sexual and maternal responses. Fear turns on a series of chemicals that change the state and reaction time of several body functions, and so on. As the interactions between the psyche and the body are bodily internal, but not purely biological as in endosemiotics, I call the semiotic aspect of this interpenetration between the biological and the psychological autopoiesis *intrasemiotics* (Brier, 2000b). These different names are coined to remind us that we deal with different kinds of semiotics. In the future, we have to study more specifically the way semiosis is created in each instance. This is a very significant part of the embodiment of our mind, but intrasemiotics seems to function as meta-patterns of endosemiotic processes. For example, our state of mind determines our body posture through the tone and tightness of our muscles. There is a subtle interplay between our perceptions, thoughts and feelings and bodily state working among other things through the reticular activation system. There is still a lot we do not know about the interaction between these systems. But the important thing to note is that we do not have any kind of absolute dualism between mind and body here, only differences in semiotic processes and interactions.

To refer to the interaction between the psyche and the linguistic system I use the term *thought semiotics*. This is where our culture offers us possible concepts to classify our inner state of feelings, perceptions and volitions. I call these classifications in their non-conceptual or pre-linguistic states, i.e. not yet recognized by conceptual consciousness, for phenosemiotic processes. For short I just call them *phenosemiosis*.

A Cybersemiotic Theory of Emergence

In my view we have not yet arrived at a well-functioning and consistent theory of emergence. See for instance El-Hani (2008), who points to the need for a shift towards a process ontology or to a Peircean semiotic philosophy as a way out of this serious problem. The more quantum physical aspects are worked out in Penrose (1995) and Stapp (2007). Baer (2010) attempts to combine quantum physics and process philosophy in his discussion of the physics of consciousness. But the lack of a good theory of emergence is a problem, as the task of such a theory is to explain how the qualities of life and sense experience and therefore qualia plus the next step to linguistic born self-consciousness in humans living in a culture can be created in the course of evolution.

I cannot deny that some computer science philosophers like Arrabales, Ledezma and Sanchis (2010) actually believe that there are small beginnings of consciousness in the form of agency in AI robots, and try to make scales to measure them. I find it highly unlikely that we are in any way near stages in development of AI and AL, where life worlds might emerge. So, the cybersemiotic view of the relation between information and semiosis is that information belongs to Secondness and must

be considered protosemiotic. When going into Thirdness, the possibility of an interpretant appears, as Peirce underlines, and as Varela (1975) shows in his calculus of self-reference.

But there are certain conditions for a system to be able to create an interpretant within our space and time frame that must be met first. One of them is the closure and self-organization of autopoiesis in a living system that is required to create an interpretant within our frame of space and time. But we probably need to add more. Hoffmeyer (1998) describes four additional steps necessary for the creation of living systems:

1. The establishment of an inside-outside asymmetry (closed surface).
2. A proto-communication over those surfaces (a community of surfaces).
3. A digital re-description in the form of DNA to carry on the form of the organism in procreation (Hoffmeyer & Emmeche, 1991, call it *code-duality*).
4. The formation of an interface (inside-outside loops) is essential for the creation of interpretants.

Machines lack autopoiesis, reproduction, code-duality, and an inner organization of membranes (Hoffmeyer, 1998), and thus also lack both individual-based and species-based motivation and intentionality, and consequently also the ability to establish a genuine interpretant. Therefore I believe that instead we must somehow enlarge the conceptual framework within which we conduct science, if we are to form connections with the phenomenological aspects of reality and the experiences of meaning. It is my belief as I have argued here that Peirce's triadic semiotics deliver a possible first step towards such a solution.

On the level of organic and cognitive evolution, Hoffmeyer, in his development of a biosemiotics, has built on an approximation to Peirce's ontology, and has suggested adding a new level of meaning to the reductionist Darwinian "survival of the fittest". This survival idea tells us a lot about rather primitive organism, but there must be something more when it comes to more and more complicated organisms with nervous systems. Neither the maximal dissipation of entropy, nor survival is enough to explain the growth of systems with inner worlds of qualia. What is it that they acquire more of? Hoffmeyer (1996, p. 61) suggests calling it *semiotic freedom* and explains it this way:

> The most pronounced feature of organic evolution is not the creation of a multiplicity of amazing morphological structures, but the general expansion of 'semiotic freedom', that is to say the increase in richness or 'depth' of meaning that can be communicated.

It is a crucial point that Hoffmeyer deals with here, because this is where the possibility of meaning comes into an enlarged framework, where science is also possible on a basis that is close to Prigogine's (1996) and Prigogine & Stengers' (1984) irreversibility and complexity theory of thermodynamics, but here adding the Peircean framework and his theory of mind. The play of signs in the freedom of consciousness becomes an attractor in cosmogony and evolution.

Connecting this idea of the free play of signs in consciousness to the problem of the emergence of emotion and inner reward in ethology that Lorenz could not solve within his standard materialistic

biological framework, and by using von Uexküll's Umwelt-concept in an evolutionary context[19], cybersemiotics regards the Umwelt as a 'sphere of signification', a term which I use in a Peircean interpretive sense to refer to the primary living space (life world) created by every living system. What ecologists call the ecological niche in the habitat becomes a meaningful sphere, a signification sphere for the living system. Seen from an ecosemiotic view it is a *semiotic niche,* as Hoffmeyer calls it.

The production of meaning is thus brought into what mechanicism sees as "dead" nature by the concepts of Firstness and Synechism combined with Hylozoism and the development of the universe through three different kinds of evolution:

1. *Thychistic evolution* (free or random variation, sometimes called fortuitous) like Darwin's natural selection.
2. *Ananchastic evolution* (dynamic dyadic interactions, a more mechanical necessity). It comes closest to Hegel's idea of evolution.
3. *Agapastic evolution* or "evolutionary love" (combining the free variation and dyadic interactions through habit formation by the mediating ability of Thirdness). This comes closest to Lamarck's idea of evolution (Brent, 1998, p. 215).

Life can be understood from a chemical point of view as auto-catalytic, autonomous, autopoietic systems, but that does not say much about how individual awareness appears in nervous systems. On the basis of Peirce's philosophy, the emergence of signs and meaning in the living world is to be expected. It is also clear that the world in its vague beginnings was not created with signs as we understand them in biosemiotics, but only a tendency to make them emerge through the law of mind. This could be called a vague tendency to final causation that evolved from the tendency to form habits.

The cybersemiotic interpretation of causality based on Peirce is that efficient causation can exist on its own as Secondness, but it is often found embedded in the formal causation of pattern fitting and signals described in information science and then in the living world clearly by final causation, which becomes conscious purpose in human society. Information seen as both protosemiosis, in evolution, and quasi-semiosis, when embedded in semiotic and linguistic processes, is between the two. It is connected to formal causation and works through signals and dualities of patterns, not yet a fully triadic semiosis, but still above the brute force of efficient causation.

The Heterarchical Levels of Evolutionary Cybersemiotic Emergence

The cybersemiotic approach that I present here unites cybernetic, systemic, informational, and semiotic approaches towards self-organization, intentionality, selection of differences, and constructivism, thus avoiding solipsism and idealism. Modern systems thinking views nature as containing multilevel, multidimensional hierarchies of inter-related clusters forming a heterogeneous general hierarchy of processual structures: A heterarchy.

[19] Jacob von Uexküll did not believe in evolution, so his theory did not include evolution in its foundational framework.

Levels are believed to emerge through emergent processes, when new holons appear through higher-level organization. I have been skeptical about the ability of this paradigm to account for the emergence of life and sense experience and later linguistically borne self-consciousness. But if this system and cybernetic view is placed into a Peircean framework, where living potentialities (Firstness) are processes manifested through constraints and forces (Secondness) into regularities and patterns (Thirdness) in a recursive manner from level to level, it makes much more sense. The new emergent level then acts as a potential for the development of the next level. Levels can form and dissolve when their dynamical parameters are near critical points. Stabilization requires that the system moves further from the critical point into organizing patterns, like energy wells. But one then has to accept a hylozoist view of matter as Hylé.

In hierarchies there is a filtering of lower-level effects rising from the bottom at each new emergent level. There is also a binding from the top, and the exclusion of alternative possibilities, once one path of emergence has stabilized (downward causation). Across levels, various forms of causation (*efficient* based on energy transfer, *formal* based on pattern recognition, signals, and information, and *final* based on meaningful purpose and thus semiotic) are more or less explicit (manifest). This leads to more or less explicit manifestations of information and semiotic meaning at the various levels in the world of energy and matter. The basic forms of causation can be seen at all levels. Material causation is basically grounded in the quantum vacuum fields. For each level of material-informational manifestation the lower level beneath it acts as its material basis.

Emergent process laws are particular to each level, allowing components to function together, and stabilizing levels in pattern-formation and structure that can be described with an objective information concept. This yields the dynamical integration that individuates each level. In the special case in which this integration involves active organizational processes we have autonomy, which creates agency through autocatalytic closure. It seems that total closure, as in autopoiesis, is important in the creation of living systems and the emergent quality of individuality laying the foundation for subjectivity. Meaning is generated through the whole heterarchy, especially through the relations of individual systems to a larger natural or social context. Thus, meaning is generated both at the individual levels of the living or humans and in social systems. But meaning is most manifest in the living systems that fulfill Hoffmeyer's conditions. The most full-blown version of meaning involves finality in a self-conscious social-linguistic mind.

The Ontological Basis of Cybersemiotics

Information theory is now an important part of the new science of consciousness research program, but there is a lot of work to do for serious philosophy, considering how many central philosophical topics of mind, language, epistemology, and metaphysics are going to be affected by the biosemiotic development. Peircean biosemiotics may contribute to a new transdisciplinary framework for the understanding of knowledge, consciousness, meaning and communication. But to do this, new elements have to be integrated to unite the functionalistic approaches to information and communication coming from cybernetics and computer science with the semantic pragmatic approaches coming from the linguistic turn and semiotics. Concepts of closure, self-organization, and differentiation of biological, psychological, and social systems developed in second-order cybernetics and autopoiesis theory need to be integrated into theories of embodiment and Peircean biosemiotics.

Let us try to summarize and schematize the basic ontological concepts of cybersemiotics made by an integration of Peirce's semiotic philosophy developed from Brier (2008a):

1. The first level, which physically is described as quantum vacuum fields entangled causality, is not considered physically dead as usually done in physicalistic physics, because cybersemiotics share Peirce's phaneroscopic and synechistic basis, where physics is never a description of an independent "dead" world. This dovetails with some of the version of the anthropic principle, especially the interactive anthropic principle (Wheeler, 1964, 1998). Cybersemiotics conceives this level as a part of Firstness, which also holds qualia and pure feeling. Although physicists may be bothered by this new metaphysical understanding of this level of reality, they cannot claim that there is no room for new interpretations because physics has a complete understanding of it. On the contrary, this is one of the most mysterious levels of reality we have encountered, and its implications have been the topic of an ongoing discussion since the 1930s and were central in the disputes between Bohr and Einstein. Now the entanglement aspect of the quantum phenomena is exploited for the possibility of teleportation and the first positive results claimed (Furusawa & Loock, 2010).
2. The second level of efficient causation is what Peirce describes as Secondness. This realm is ontologically dominated by physics as classical kinematics and thermodynamics. But for Peirce it is also the willpower of mind, and in modern information science it is the differences, which, when interpreted, can become significant and meaningful.
3. The third protosemiotic level is the level of objective information, where the formal causation manifests itself clearly. This level is ontologically dominated by the chemical sciences and concepts of pattern fitting. This difference in ontological character may be one of the keys to understanding the differences between physics and chemistry. It is not only a matter of complexity but also of organization and type of predominant causality.
4. On the fourth level, where life is self-organized, the actual level of Thirdness and semiotic interactions emerge. First internally in multi-cellular organisms as 'endosemiotics' and between organism as 'sign games', this framework – based on biosemiotics – points out that the informational concept may be useful at the chemical level of analyzing life, but it is not sufficient to capture the communicative, dynamic organizational closure of living systems. This is one of the reasons why Maturana and Varela do not want to use the information concept in their explanations of the dynamics of life and introduce the concepts of autopoiesis and structural couplings. Cybersemiotics proposes to combine it with semiotics in Luhmann's more advanced triple autopoietic systems science.
5. Finally, on the fifth level, human self-consciousness emerges through syntactic language games, and with that come rationality, logical thinking and creative inferences (intelligence). Intelligence is closely connected to abduction and conscious finality. Abduction is crucial to signification. It is the ability to see something as a sign of something else. This something else has to be a habit of nature. Some kind of regularity or stability in nature that the mind can recognize because a law of some kind is necessary for it to be a fairly stable eigen-value in the mind (an interpretant).

The cybersemiotic approach explains this through a semiotized version of Luhmann's triple autopoietic theory of communication combined with pragmatic theories of embodied social meaning. The three levels of communication are consistent through exterior cognition as well. Figure 5 gives a visual summary of this part of cybersemiotics.

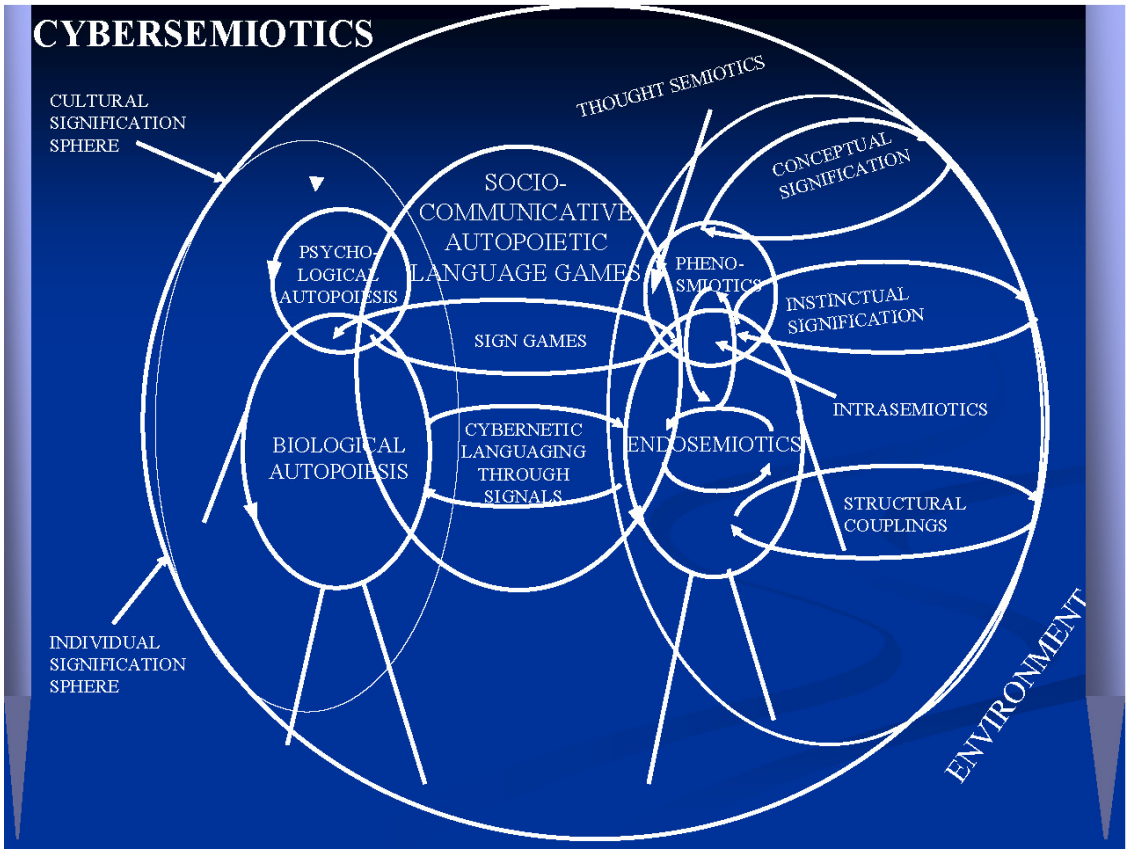

Figure 5: Cybersemiotic model classifying different types of semiosis and proto-semiotic processes*: The model is a cybersemiotic development of Luhmann's model shown in figure 2. The localization of the processes have nothing to do with the actual bodily locations (as the head, for instance, is also a part of the biological autopoiesis), and as such also have endosemiotic processes. To limit the complexity, I have placed all the cybernetic-autopoietic concepts on the person to the left and all the semiotic ones on the person to the right. But all concepts concern both persons. Each person is placed in a signification sphere. When these are combined through socio-communicative autopoietic language games, a common signification sphere of culture is created. One part of ecosemiotics signification is based on the linguistic processes of conceptualization and classifications. Underneath the language games level is the biological level of sign games based on instincts, and under that, the cybernetic languaging seen as the coordination of coordination of behavior (of two black boxes). Thus, ecosemiotics has a level of bio-psychological or emphatic signification, as well as a level of structural couplings, which the organism, or rather the species, has developed through evolution. Although the figure does not seem very simplified it is even more so, as it combines several simplified figures. But it functions as a tool to view the relations between the different levels of semiosis. Combining these levels of semiosis with a general systems theory of emergence, self-organization and closure/ autopoiesis, it constitutes an explicit theory of how the inner world of organism is constituted and therefore how first person views are possible and as real as matter. This produces a view of nerve cell communication based on a Peircean world view tying the physical efficient causation described through the concept of energy and the chemical formal causation described through the concept of information together with the final causation in biological systems described through the concept of semiosis.*

Conclusion

Thus, the semiotic, autopoietic, social and cultural communicative praxis becomes the epistemological center of our understanding of ourselves as autopoietic embodied brain-borne self-conscious intersubjective beings situated in language and environment. From this situation we develop knowledge about ourselves as conscious beings, about society, language and culture in order to understand our intersubjectivity, and knowledge about our bodily nature and finally the environment. These become the four specializing aspects of Wissenschaft. None of them are absolute in any way, as they are in an evolutionary and historical drift with our ecological and semiotic niche for survival as species and culture.

To obtain this transdisciplinary view we have had to enlarge our concept of reality to a multi-layered irreversible time dynamics in a world perfused with signs. Energy, matter and objective information are not the only elements making up this reality. Signs, concepts, life processes and subjective experience plus socio-communication – of which language and culture is a part – are at least as important. The reason is that without them, there would be no knowing, no knowledge and no Wissenschaft. Language, culture and subjectivity are objective elements and aspects of reality as inevitable as dead and living nature.

The paradox is that we need all four arms of the star in order to produce all the kinds of intersubjective knowledge we now have. Among the most important is Wissenschaft (together with politics and religion). And yet we have produced the four aspects of Wissenschaft ourselves from our embodied and conscious socio-pragmatic semiotic interactions, thus forming our own *cultural signification sphere*. The reality and viability of this meaningful sphere that every culture creates for its individual subject and for itself in the environment is being tested for viability all the time. Cultures can crash completely as the Rapa Nui culture on Easter Island, where religious and social competition may have overruled ecological concerns, when the Rapa Nui people cut down all the trees to build their devotional statues, the Moai. Once the island was deforested, the ecosystem was unable to support the human culture and it crashed in hunger and internal fights – or so we believe.[20] Diamond (2005) described Rapa Nui – among many other examples of collapsed societies in the past – as the clearest example of a society that destroyed itself by overexploiting its own resources.

In her book *Cosmopolitiques* Stengers (2007) sees the main problem of the received view of biology as a science to be its attempt to join physics and chemistry in a rather positivistic attempt towards unification of all sciences like E. O. Wilson's (1998) *Consilience: The unity of knowledge*, where he predicts that most of the humanities will be replaced by hard scientific knowledge. Consequently, the received version of science denies the validity of all claims and practices other than its own. It denounces all other discourses – for instance, from hunter-gatherer societies living in close interaction with living nature – as superstitious, irrational and grounded in mere "belief". And yet research demonstrates that many of these discourses contain much meaningful practical insight, as for instance Roy Rappaport (1984) showed in his book *Pig for the ancestors*. He studied the Tsembaga Maring group of slash-and-burn farmers and their view

[20] I am aware that there is now a debate about the truth of this story and alternative versions upgrading the influence of rats destroying trees and white people killing islanders and taking them as slaves.

of nature in New Guinea and concluded that their spiritually guided ritual cycle operated as a homeostatic ecological process regulating a whole emerging from the interaction of the size of the pig population, the amount of acreage cultivated, their energy expenditure in subsistence activities, their protein ingestion as well as the man-land ratios combined with the frequency of internal fighting between villages. His functional analysis was based upon quantitative data. It is an example of the degree to which cultural and non-cultural variables interact through meaningful semiotic events. Rappaport challenges the scientistic view that the meaning of religious rituals has no effect upon the external world. Harris (1991) investigated how pork turned into a religiously tabooed food in, for instance, ancient Israelite society. Harris also argues from a blend of spiritual and ecological knowledge of the nomad culture, and claims that while cattle, sheep and camels consume grass efficiently, pigs are poor grazers and must compete with humans for grain. Furthermore pigs produce no utility aside from meat, compared with cattle and goats that provide milk, transport, and labor. Harris argues that this gave rise to the pigs being tabooed food in the Old Testament and in Ancient Egypt, eventually to become forbidden by Islam. Harris is convinced of the primacy of humankind's ecological roles and modes in shaping meaningfulness in human culture. The problem with the consilience-view of nature is that, through science, it presents nature as one thing opposing a multitude of other "things" called culture. But there are many very different cultures with many interpretations of the complex we call nature. Cybersemiotics is consistent with for instance Descola's (1996) work on *Constructing natures* as well as Latour's (1993, 2004, 2007) semiotic work on 'hybrids', which is discussed further in Brier (2012). Nature is not only built out of energy, matter and information, it is also built from signs interacting with all the other elements.

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