

CYBERSEMIOTICS: MERGING THE SEMIOTIC AND CYBERNETIC EVOLUTIONARY VIEW OF REALITY AND CONSCIOUSNESS TO A TRANSDISCIPLINARY VISION OF REALITY



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INTRODUCTION

The modern notion of 'Laws of Nature' (covering laws) sees the universe as governed by a set of all encompassing laws. We may have great complexity at the surface of reality but underneath that surface at the - so to say - bottom of reality, there are a small amount of abstract mathematical laws governing every process in reality. This paradigmatic ontological assumption makes the world rational intelligible and makes it possible for the science to flourish as the central objective way to truth. But how does subjective consciousness with its qualitative sense experiences (on which empirical science is based) fit into the worldview the self-science makes? Classical physics seem to narrow in its view to encompass the scale of reality, as we know it to day. It is a problem that is discussed in many books for instances like Barrow, Davies and Harper's (2004): *Science and the Ultimate Reality*, by many physicists and philosophers of science inspired by the quantum physicist John Archibald Wheeler. The quantum physicist and philosopher of science Abner Shimony(1993) regards the knowing subject as an entity in nature whose faculties must be studied from the points of view of evolutionary biology and empirical psychology. Nicolescu (2002 p.65-66) - who is also a quantum physicist - promotes, like C. S. Peirce (1994) does, the theory that consciousness is a vital and active part of the wholeness of the universe. The subjective and the objective side of nature make up the whole of reality to an integrated whole based in what Nicolescu calls trans-nature or the zone of non-resistance. The reason why I have created the framework of Cybersemiotics (Brier 2008a, 1010b, Copley 2010) is to enlarge our view of reality in a way that will make this possible.

LIMITS OF DETERMINISTIC PHYSICALISM

Laws of nature are often viewed as complete, not only for non-living material but also for living creatures as well as human beings. Such a notion has been presented in its most clear form in the well-known statement of Laplace (1749-1827) in his *Philosophical Essays of Probabilism*:

We may regard the present state of the universe as the effect of its past and the cause of its future. An intellect which at any given moment knew all of the forces that animate nature and the mutual positions of the beings that compose it, if this intellect were vast enough to submit the data to analysis, could condense into a single formula the movement of the greatest bodies of the universe and that of the lightest atom; for such an intellect nothing could be uncertain and the future just like the past would be present before its eyes. (Laplace 1951:4)

Laplace strongly believed in causal determinism. The appeal of such a position lies in its simplicity; one formula applies to the whole universe. There was no room for conscious subjects having any independent influence on the process of the world and being active subjective agents. This was pretty much also the view of Newton. Leibniz united these theories in his idea of closed monads originating in a pre-stabilised harmony, with God ensuring and determining that all further process stayed in that harmony. Subjects interacting and making decisions by themselves and intersubjectively together would mess up this beautiful harmony. But the problem is that the existence of subjects and subjectivity are an 'objective' fact! This is an inconvenient fact that not even a philosophical mind like John Archibald Wheeler (1994, 1998) is able to cope with in his theory of the interactive universe.

In science we have as a prerequisite outside the theory - living embodied conscious subjects linked by knowledge-sharing in language confronting one or more objects. In science the first-person living consciousnesses of the subject(s) as observers are considered to be outside the world they observe. In the biological sciences the observers share the life experience with their objects that are also living and therefore experiencing. It is sadly often forgotten in molecular definitions of life that it is a basic and common trait of all life that it senses and experiences, a fact not easily explainable from a molecular level. We can kill the life we investigate to find out the molecular structure, but then we are confined to physico-chemical approaches as the life and the agency of the living is gone. But when studying living beings in the state of being alive, sensing their surroundings and creating their own Umwelt and Innenwelt (Uexküll 1934, 1982), we are in a qualitatively new situation, as we have to accept that the living systems experience the environment in a specific manner, which will most often be partly different from ours (remembering Nagel's famous article about the problem "What is it like

to be a bat?"). Thus, we are in a second order situation where we, as observers, are observing observation. But we cannot in any direct way observe what the other observers experience and therefore we cannot pursue empirical science on the matter.

The new science was, in the eighteenth century through the Enlightenment period, fighting for its independence from the church, which was the original authority on knowledge through its claimed access to divine knowledge. The church's authority was emerging through its authoritative interpretation of the holy book. In this way, religion also avoided making the human subject the source of authoritative knowledge. But science was winning and by the time of Laplace in the development of the scientific world view the hypothesis of God disappeared from science. What was left was only universal laws – originally understood as the thoughts of God, a metaphor modern physics still uses – controlling both mind and matter. Thus, this view leaves room neither for the subject nor the idea that it could have any causal influence on the world of matter, energy and force. Free will is considered an illusion and truth a mechanical as well as a logical entity. Paradoxically, science differed from religion by being based on the intersubjective interaction through communication of subjective knowledge formulated through language in testable hypotheses and not on the holy book as a direct line to the divine view of the world. Knowledge was no longer to be built from, or on, faith in various metaphysical ideas, but on observation, logic and mathematics.

From Auguste Comté through to the Vienna Circle between the world wars, the positivists hoped to avoid the pollution of knowledge by subjective experience - at least (non-rational) feelings - by inventing an idea of science that tried to circumvent any other aspects of the subject's interpretation of sense perceptions but the logical. Logical positivism tried to invent one unified logical-mathematical language to reach 'subjective-free', 'objective', true and proven scientific knowledge, making the foundation of a unity of science from physics through social science to humanities including culture studies of meaning universes.

DEVELOPING A NEW PARADIGM OF THE CONNECTION BETWEEN KNOWLEDGE AND REALITY

As we all know, this very idealistic attempt to establish a subject-free objective knowledge failed. Furthermore, we still have the problem that mechanism cannot explain how we can decide to move our bodies by way of mere intentions, nor can it explain routine experiences (such as pain or pleasure). In other words, the mechanical materialist and deterministic view not only - more or less - ignores free will, but also ignores the causal relevance of the mental processes that produced my very decision to move my hand when in this very moment writing my thoughts down on the computer. The most common dualistic way to perceive this is to claim

that in doing so I mentally create movement of the atoms of my body based only on conscious thought processes. A monistic interpretation will say that it is my brain that does it. But how can the brain have a free will and conscious experience? This idea is therefore eliminated and the scientific explanation therefore loses connection to the views our democracy is built on. On the other hand the dualistic interpretation indicates that some kind of deep connection between mind and matter, which we have no idea how to describe and define, must exist.

The idea of free will and a personal responsible individual subject of which human rights, our juridical system as well as our political system of democracy, are built are often ignored as irrelevant for science. The eliminative materialist like Churchland (2004) and Dennett (1991) think that these conceptions are only folk psychology and therefore can be dismissed as illusions with no scientific and philosophical value whatsoever and want us, instead, to change to a more scientific view. But as a philosopher of science and a scientist, by the way I believe that they violate the foundation of science in the real world of embodied conscious, meaningful communication through language and in culture, which is the origin of science as a social knowledge strategy. Further, science itself discovered a fundamental theory that changed the whole game of knowledge as well as the role of emotional and consciousness in the world: namely, evolution.

When evolutionary theory appeared both for the living as well as for the dead world of nature in the form of a cosmogony in the middle of the 19th century, the paradox became bigger. Because, if inert matter was first, and sense experiences appeared next in evolution of life, then meaningful cognition and consciousness must have its origins in matter, the mental must spring from the development of the physical. But there was a strange loop here, since we had defined the physical aspects of reality through the science traditions we had developed intersubjectively between us over a long historical and cultural development. Thus, presently neuropsychological studies seem to tell us very little about the nature and origin of experience, meaning and interpretative understanding, but a lot about how brains and bodies function. But if we – for instance for the sake of medicine - want to create a transdisciplinary¹ scientific theory of information, cognition, consciousness, and meaningful communication, the first problem seems to be that we need to attend to is to adjust the ontology in the theoretical framework of the different subject areas that is going to be integrated in our transdisciplinary paradigm to make them compatible in a bigger context.

¹ For lack of a better word a *Transdisciplinary Paradigm* is what I will call what we aim for. The concept *transdisciplinary science* is supposed to cover the sciences, as well as humanities and social sciences, much like the German word ‘*Wissenschaft*’ or the Danish word ‘*videnskab*’. Basarab Nicolescu has written the *Manifesto of Transdisciplinarity* (2002), where he explores or rather develops the consequences of a transdisciplinary view of the world and the sciences.

The second problem apart from that science has no theory of phenomenological experience seems to be to convince scientific researchers working within the received view of science that they actually have a paradigm with some ontological assumptions, which could be different. This is often very difficult, as it has been part of the positivistic heritage not to concern oneself with metaphysical questions in science, which has led to a lack of knowledge about concepts and language that could help critical reflections in this area. Logic and metaphysics are intimately connected, as major philosophers such as Kant and Wittgenstein have always been aware. Moreover, there is no reason to believe that contemporary views in logic and metaphysics do full justice to either topic. C.S. Peirce's work in semiotics, on the other hand, presents a distinctive picture of logic, metaphysics, and their inter-connection.

The third problem is to find a new ontological and epistemological framework that gives the possibility to integrate the knowledge we have into a bigger picture. In this article I will report my attempts on step one and three. Step two is an ongoing dialogue and interaction among the various sciences and humanities on the acceptance of the relevance of what I am doing and that is part of the argumentation in this article.

THE CHANGES IN THE SCIENTIFIC VIEW OF NATURE

What I have worked with over the last 30 years is to try to change this ontological framework in a way that does not destroy the results science has given us so far, but relativize the claim of natural science being basic and universal at the same time. To put it in another way: to make scientists realize – as for instance Barrow (2007) does - that physics does not cover all of *Physis* and we cannot expect the Universe to contain a secret of mathematical formulas that can explain conscious and cultural meaningful experience. It is my view that this is necessary to establish a new transdisciplinary foundation as an alternative to the positivist unity of science, to be able to rephrase the question about what constitutes the relation between brain processes and experience.

In the book *Order out of chaos* based on Ludwig Boltzmann's probabilistic interpretation of thermodynamics, Prigogine and Stengers (1984) developed an epistemology and philosophy of science based on a view that took seriously complexity and irreversible evolution at the physical level. They therefore distanced themselves from the determinism of mechanics and its belief that it is possible to find some abstract and eternal simple universal natural laws "behind" the complex forms of representations which determine all events in the universe. Prigogine and Stengers (1984) accept chance as real and a necessary element of evolution. In their understanding, evolution requires the creation of radical new things, patterns and phenomena that cannot be predicted from a basic physical understanding of the

universe. They also realize that the acceptance of the evolutionary idea is in a fundamental paradigmatic conflict with classical physics, but perhaps not with quantum physics. Even though Prigogine got the Nobel prize the science-theoretical work by Prigogine and Stengers (who is a philosopher of science) had great difficulty in getting accepted in the well-established mechanical/physical circles. But building at least on thermodynamics, research into complexity, non-linear systems and fractal mathematics, biology should be the science of the organizational principles that make living things 'living'. Biology still lacks convincing explanations of how self-organizing and self-replicating entities produce life and the ability to experience. Several researchers have continued to try to explain one of the major creative elements in a *self-organizing universe* that could produce life. Eric Jantsch (1980) was probably the first one to harbour a systemic and cybernetic view, but the most prominent in the last 20 years has been Stuart Kauffman (1993). The thermodynamically and ecological thinker Robert E. Ulanowicz, whose latest book from 2009 is called *A Third Window. Natural Life Beyond Newton and Darwin* is also very interesting. Ulanowicz is critical of atomism and reductionism and wants to open a third scientific window towards reality. He notes that biology, in the form of molecular biology, remains the most ardent champion of the old atomistic and reductionist approach. Ulanowicz shows that the DNA molecule in itself does not direct evolution. This is done by the enzymatic processes that read, select and edit the genome in the context of the life of the cell, which is far more complicated. This is a crucial insight that is also important in the developing biosemiotics (Brier 1999, 2000, Hoffmeyer 1996, 2008, Favareau 2010) that can be given a new possible transdisciplinary foundation in its Peircean form (Brier 2008b).

EVOLUTION AND TELEONOMY

Jacques Monod highlighted in the famous book *Chance and Necessity* (1971) the apparent epistemological contradiction between the teleonomy of living organisms and the principle of objectivity in science based on the ontological assumption of the natural sciences that there is no intensions or meaning in nature. Monod combines scientific realism, positivism and French existentialism in his efforts to show the contingency of human existence opposed to the religious idea of our central importance and ethical obligations in a sort of covenant with the divinely created Cosmos.

But at the same time Monod admits that science cannot explain how human being can emerge in this meaningless and objective universe, which much of classical physics has claimed to be the whole picture of nature so long ago that we have almost forgot that it is a metaphysical decision. Thus we are still stuck with the basic problem of explaining, how can the inner world of first person experience

arise in the dead deterministic physical and closed world? Monod's whole argumentation shows that science cannot explain this.

In Genesis it is God who created life, but in the paradigm of evolution, science has to explain life as something, which occurs inside the universe by virtue of the same general principles that science uses to explain the physical and chemical aspects of the universe. So how do living experiencing systems emerge from the "dead" nature? Evolution is creativity, constantly creating new systems, and these systems become, when they are alive, more and more creative. But mechanical systems are not creative.

Since Norbert Wiener established cybernetics and integrated information theory and thermodynamics, information scientists have tried to explain the phenomenon of life using the new concept of information, which Wiener and Schrödinger created and Schrödinger (1967) used it in his book *What is life*. Their starting point was Claude Shannon's mathematics, but they redefined information from being entropy (Shannon's view) to neg-entropy; namely order and structure. This was Wiener and Schrödinger's view from which they tried to build up theories of life and consciousness. This view has been imported into cognitive science and artificial intelligence research, looking at the human brain as an information processing system in line with the computer. But such a framework does not give access to theories of qualia² and first person consciousness (Brier 2007, 2008,b,c, and 2009 a and b) before it can explain how experience, qualia and emotions can arise from computational processes..

CHANGING OUR BASIC UNDERSTANDING OF PHYSIS

It is therefore clear for many researchers that an evolutionary theory of information, cognition, meaning, conscious and communication put certain demands on the ontological presumptions of nature by science, if we do not want to bypass science (Küppers 1990). Even if we believe in emergence, it is difficult to take departure in a paradigm of nature based on an ontological materialism that sees nature and the emergence of conscious man as completely determined by absolute and universal natural laws. Actually a theory of emergence is not compatible with mechanical materialist determinism that is based on a reversible time and a belief in a simple ground state of things. Thus there is no real irreversibility and new levels of complexity as Prigogine managed to describe them in his non-equilibrium thermodynamics (Prigogine and Stengers 1985, Prigogine 1996).

² The ability to have different experience of for instance red, blue and green as well as different tastes and notes, Which also mean that you like the experience of one more that the other.

In contrast, Prigogine saw the mechanical systems as a special subclass of physical systems, not the foundation for all physical systems. Only a part of nature can be described satisfactory this way, which the later non-linear system revolution in mathematics has shown. This is a very important shift in ontology. Most of the physical systems in nature were very complex and dynamic; maybe even hyper-complex, with a stream of energy through them, developing in irreversible time into more complex dynamical states in ways not precisely predictable. Furthermore Einstein's relativity theories told us, that matter is not the physical ground state; energy is. Matter is energy stabilized in an interlocked dynamical form, a kind of a causal homeostatic cybernetic circuit. Information theory's basic definition of information has been developed to be difference, form and structure within contexts. So the answer to the question: What is the ultimate nature of reality? Is it informational structures ?

A common view among information theorists is that information integrated with entropy in some way is a dynamic basic structure of the World. Furthermore computation is viewed as the central process of the dynamic change of information. In order for anything to exist for an individual, she must get information on it by means of perception or by re-organization of the existing information into new patterns. This cybernetic-computational-informational view is based on a universal and un-embodied conception of information and computation, which is the deep foundation of "the information processing paradigm". This paradigm is vital for most versions of cognitive science and its latest developments into brain function and linguistic research. Taken to its full metaphysical scope this paradigm views the universe as a computer, humans as dynamic systems producing and guided by computational functioning. Language is seen as a sort of culturally developed algorithmic program for social information processing (Chaitin 2010, DodigCrnkovic, G. 2010).

What seems to be lacking is knowledge of the nature and role of embodied first person experience, qualia, meaning and signification in the evolution and development of cognition and language communication among self-conscious social beings and formed by the grammatical structure and dynamics of language and mentality. A transdisciplinary paradigm of information, cognition and communication science needs, within its theory, to engage the role of first person conscious embodied and intersubjective social awareness in producing signification from percepts and meaning from communication. This is necessary in any attempt to build a transdisciplinary theoretical framework for information, cognition, signification and meaningful communication.

Thus we have to embrace what the semiotic philosopher and logician C.S. Peirce(1994) calls *cenoscopic science* or, to use a modern phrase: *intentional sciences* (Brier 2010a). If it does not do so, but bases itself on physicalism, including

physicalistic forms of informationalism such as info-computationalist naturalism, it is going to be difficult to make any real progress in the understanding of the relation between humans, nature, computation and cultural meaning.

But to propose a theory of knowledge one must dare to say more about the world and its connection to the observer than it is just an infinitely deep, spontaneous, chaotic, closed and expanding space-time geometry where energy is getting bound up in structures we call matter (elementary particles) in an uneven way in the field we call gravity, who's drawing force acts like a stabile tendency to produce order in an expanding universe. The uneven distribution of the first particles make them attract each other and when the first Hydrogen atoms are formed their mutual attraction bring them so close together that fusion processes start and make stars wherein heavier elements are created by further fusion up to iron. Supernova explosions create elements heavier than iron and spread the molecules out in space where then spontaneously driven by gravity and electromagnetism create molecules. This matter collects into planets through gravity and the flow of energy from the star (sun) creates self-organizing systems far from equilibrium that get more and more complex macro-molecules. These self-organize and interact with each other in a more and more regular fashion that makes it possible to build new system of the same kind by chemical inherence of macromolecular structures like DNA, RNA and proteins. Membranes and Organelles spontaneously self-organize and combine into cells. Suddenly they are living beings, while the rest of the objects we have mentioned have been physical or chemical objects only. Different forms of cells combine into the modern complicated cell with many different organelles like mitochondria and Golgi apparatus. The cells combine into multi-cellular living systems. Later organs emerge, some of them sense-organs the combination with a nervous system that suddenly makes sense-experience possible. How this is possible, brain science has not clue.

But what is the need of sense organs for dead and inert systems? No doubt they can be used like in robots to orient the systems related to other structures in the environment with suitable structural couplings as Maturana and Varela (1980, 1986) calls them. But from where in the received view of physical cosmogony, chemical and then biological evolution does the ability to be aware and have experiences emerge? Science does not know.

We must further theorize how the processes of cognition and communication develop beyond their basis in the perturbation of and between closed systems to a theory of feeling, awareness, qualia and meaning. That does not exist in Bateson's (1973) mind-cybernetics or in Maturana and Varela's (1986) autopoiesis theory either! Still their concept of *structural couplings* helps defining the biological embodiment of the observer and the individual interest, as the basis of cognition

and coding. But the autopoietic model lacks a theory that explains emotion and self-aware consciousness, though Maturana does write about emotioning and love as something that exists in the world as real.

The German system theorist Niklas Luhmann, who was inspired by Bateson as well as Maturana and Varela, extend the autopoietic model to the psychological as well as the socio-communicative level. Luhmann (1995) thus put up a triple autopoiesis model, where both the biologic and psychic systems are silent and only the socio-communicative communicate. Biological autopoiesis function in the medium of life and psychic and socio-communicative autopoiesis functions in the medium of meaning In Luhmann’s (1990) provoking punch line: “Only communication communicates!” Thus communications are viewed as autopoietic systems. Figure 1, shows a drawn model of how Luhmanns tree autopoietic system combine in human cognition and communication.

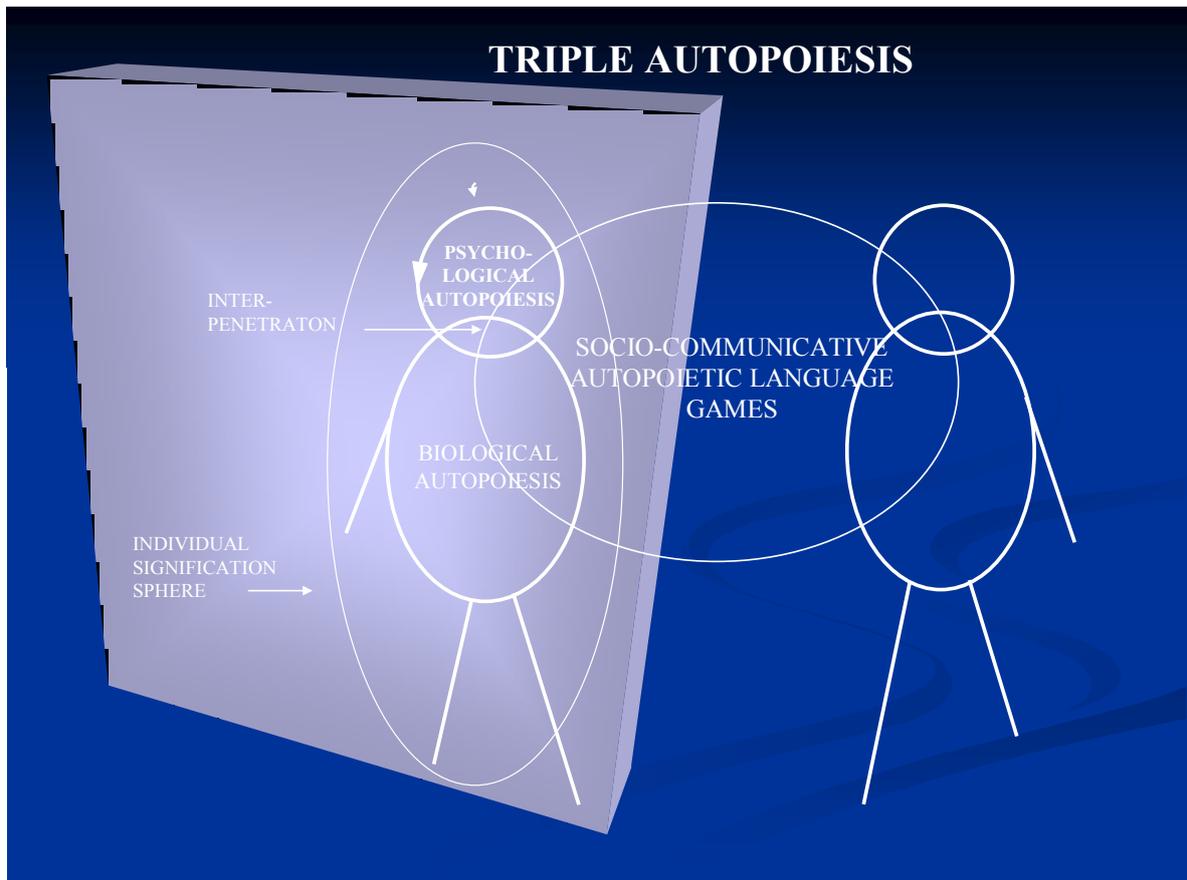


Figure 1: *Three organizationally closed systems working separately make communication possible. This figure is a symbolic iconic picture of Luhmann’s basic theory and not a map of where the various systems are placed in the body. Psychological processes for example are not only in the head and so on, but the head is symbolizing the mind here. The signification sphere is the biosemiotic term for von Uexküll’s Umwelt and Maturana’s(1988a+b) “Cognitive domain”.*

My main problem here is where do first person experiences belong in this scheme of things? How do systems go from being able functionally to orient themselves in relation to environmental structures and other members of the species to have sense-organs giving 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, it is only biological systems that produce nervous system and central nervous systems that create awareness, feeling, sense-experience and qualia. But biologists insist on describing their subject area in chemical and physiological term and consider molecular biology to be the greatest advantage since Darwin. The vitalism debate has ruled out that there are 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. But how should that create the difference, which produces consciousness?

Recently Marcel Barbieri (2001) has pointed out that there actually is a difference in molecules inside and outside the living systems. The reason for this lies in the fact many of the proteins that are constructed by the DNR, RNA and ribosomal protein synthesis machinery are not found outside living systems at all. They are not spontaneously produced in the start dust as so any of the living systems vital molecules. These proteins are only produced inside living systems composed of at least one cell Thus Barbieri's(2009) theory is that *life is then partly based on artificial molecules* - seen in relation to the molecules in outside physical and chemical environment - which the living systems autopoietic machinery has created and keeps on reproducing. Conscious awareness is again seen as the product of new brain codes, which is not untrue. But that does not say much about the emergence of experience.

Thus in the beginning, “knowledge” exists only as embodied in the inherent structural dynamics of the autopoietic entity. But is it knowledge without life and sense experience? This is usually what is implied by the physical, chemical and objective information description type. I doubt it, but these experiential phenomena as sense experiences and awareness are usually not part of the biological story of the development of life and knowing.

The biological description is done on a pure chemical level, and even though we cannot produce a living cell in our test tubes today, it is believed that chemistry is all that there is to this development of *agency*. AI researchers often believe that the agents they can develop in computers have pretty much the same abilities and do not see any special abilities in living system other than complexity. Arrabales, R., Ledezma, A. and Sanchis, A. (2010) is a good example for the development of such a paradigm. Still, we believe that it is the combination of cells into specialized organs to registries perturbations in the physical chemical

environment that gives rise to sense experiences that can make a difference make a difference. But when and how do we go from chemistry to biology and then to psychology and finally to communication as Luhmann's model clearly separate the three systems?

With his calculus for self-reference, Varela (1975) inspired from his work with George Spencer-Brown (1979) is aware of the possibility of establishing a new and more intimate connection between epistemology, logic and ontology in the biological science:

The principal idea behind this work can be stated thus: we choose to view the form of indication and the world arising from it as containing the two obvious dual domains of indicated and void states, and a third, not so obvious but distinct domain, of a self-referential autonomous state which other laws govern, and which cannot be reduced by the laws of the dual domains. If we do not incorporate this third domain explicitly in our field of view, we force ourselves to find ways to avoid it (as has been traditional) and to confront it, when it appears, in paradoxical forms.

(Varela 1975: 19)

I think this is what we have been talking about so far as missing from traditional biological science: distinct domain, of a self-referential autonomous state, which other regularities govern, and which *cannot* be reduced by the laws of the dual domains. A difference cannot become knowledge before it has been interpreted to be so meaningful and important that an observer/knower attaches a sign to it. Then it will make a difference. But the ontological basis of this theory is still unclear. In this work Varela moves towards Peirce's triadic semiotic view of logic, thinking, sign processes as cognition and eventually the self as a symbol.

Peirce (1994) did not consider the atomic view sufficient, but view the world as a continuous manifold of at least three basic categorial types: Firstness, secondness and thirdness. A manifold conception of mind supports views of knowledge and reasoning as situated and distributed He was critical of directions being taken by his contemporaries not at least Bertrand Russell that ignored these critiques of the dualistic view. Peirce wrote to Victoria Welby:

“ The criticism which I make on that algebra of dyadic relations ... is that the very triadic relations which it does not recognize it does itself employ. For every combination of relatives to make a new relative is a triadic relation irreducible to dyadic relations. ”

Peirce (1994) Letter to Victoria Welby. (October, 1904)

Peirce is arguing that “thirdness” is a necessary addendum for the correct interpretation of logical text, to be viewed as the social behavioural outcome of the sign action, which is essential to Peirce's Pragmaticism. George Boole, who was in the same logical tradition as Peirce writes:

...it is the business of Science to investigate laws; and that, whether we regard signs as the representatives of things and of their relations, or as the representatives of the conceptions and operations of the human intellect, in studying the laws of signs, we are in effect studying the manifested laws of reasoning.

(Boole 2005/1853 24.)

Thus the basic idea is that the investigation of laws, applies itself to the laws of signs at such a level of abstraction that its results are the same no matter whether it finds those laws embodied in objects or in intellects, which promotes the formal approach in mathematics. Peirce then investigates the forms of triadic sign relations as the practical problem of inquiring into the sign relations that exist among commonly accessible objects and publicly accessible signs.

"Logic will here be defined as formal semiotic. A definition of a sign will be given which no more refers to human thought than does the definition of a line as the place which a particle occupies, part by part, during a lapse of time. Namely, a sign is something, A, which brings something, B, its interpretant sign determined or created by it, into the same sort of correspondence with something, C, its object, as that in which itself stands to C. It is from this definition, together with a definition of "formal", that I deduce mathematically the principles of logic."³

(C.S. Peirce 1980, 20-21 & 54.)

Thus what is transferred are signs, not information. Signs have to be interpreted, and it has to happen on a least three levels. 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 goes on at the next level of instinctual sign plays of drive and emotionally based communication about meaningful things in life like mating, hunting, dominating, food seeking, territory etc. Based on these two levels a field of meaning is created that the socio-communicative system can modulate to conscious linguistic meaning.

³ Peirce considered pure mathematics to be a more fundamental discipline than logic. According to Peirce logic come from mathematics and not the other way around as some researchers and philosophers believe.

But here there is also the problem of our scientific explanations being tied up in a linear temporal thinking, where the thing or process before another in time becomes the cause of this second later develop thing.

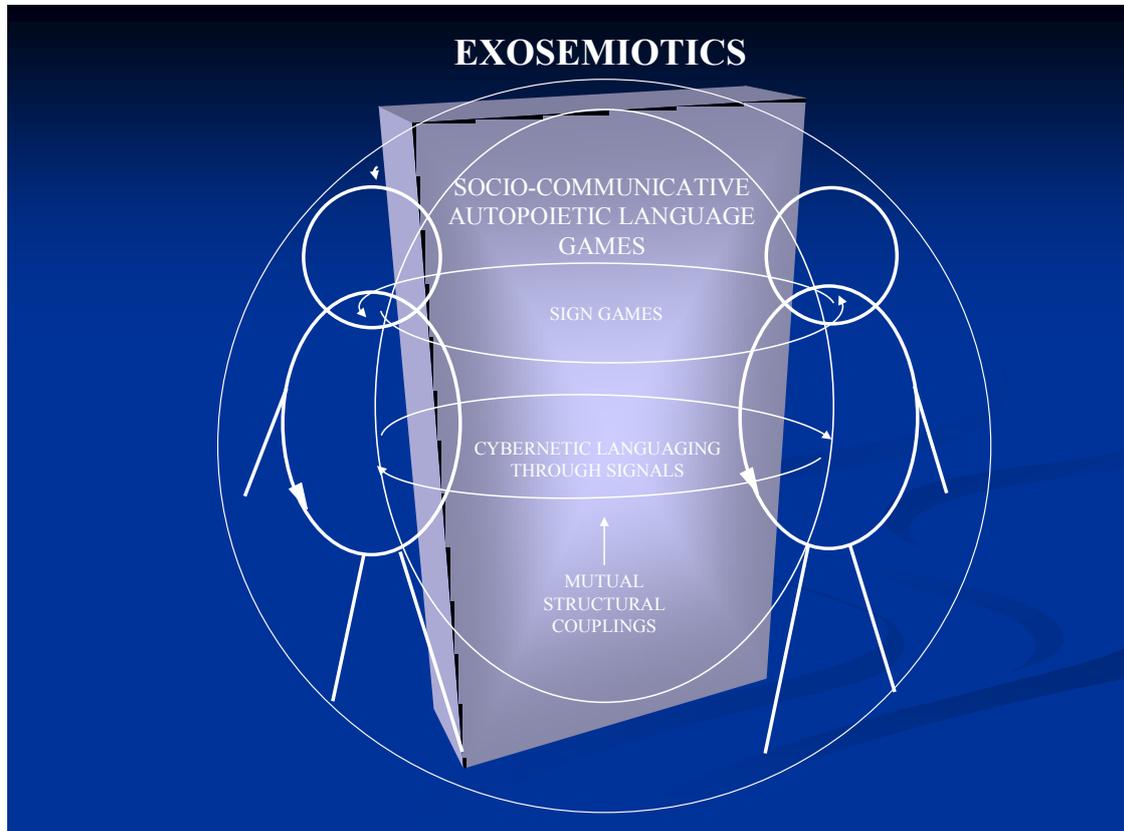


Figure 2 shows the three different levels of communication systems described in cybersemiotics. At the foundation is the informational exchange of signals of orientation and other reflexes, which Maturana(1988a+b) calls 'linguaging'. On the next level we find the ethological (or what we below will call the biosemiotic) sign games of all living systems mostly within the 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. Caution of the simplification also goes for this figure.

CYBERSEMIOTIC STAR WITH COMMENTS

As a consequence of the broad agreement that human beings are embodied, feeling, and knowing cultural beings in semiosis and language, one can say that we therefore can be seen as living simultaneously in four different worlds, which are qualitatively different from Popper's "Three Worlds" (Popper 1972) and should therefore not be confused with them. These four worlds are.

1. Our body-hood as the source of life, which we share with other living species.
2. Our inner world of feeling, will, drives, affects and thoughts, manifested as mind, consciousness and self-consciousness.
3. The physico-chemical-informational knowledge of the (none-living) environment of the natural world.
4. The cultural world of language, meaning, power and technology such as the informational machines we call computers.

As knowledge types each of the four worlds has historically developed its own type of narrative, especially in its fundamentalist and reductionist versions. Physicists and chemists tend to view the universe as consisting of matter, energy, and meaningless cybernetic information. Mechanical biologists extend this view into their area, but non-mechanical biologists tend to perceive the universe as basically animate or at least view the living systems as the basic organizers of reality. The social and cultural sciences, especially the dialectical and historical materialistic ones, as well as the radical social constructivist ones, tend to see the world as constructed from social, human, and linguistic interpretations, unless they are dualistic, accepting that nature is just as science describes it (Brier 2008c). Thus, Energy, Life, Consciousness and Meaning become separated in different domains or worlds. But this is a paradox, since we know from our everyday life world, experienced in linguistic communication that they are not in anyway absolutely separated. Thus the incompatibility of these four dominant views in the Western world's systematic "scientific" knowledge including the humanities and social sciences is a deep paradox in the modern worldview's attempt to build a "unified narrative" of the world.

Cybersemiotics, which includes a Peircean semiotics integrated with the cybernetic and systems views of reality, can be seen as a new transdisciplinary philosophical framework that attempts to avoid these inner inconsistencies. Some of the core aspects of this framework are combined into the model called the Cybersemiotic star for those who, like me, get a special kind of knowledge by looking at such visual representations. Those I encourage to consult Figure 3. Others may stick with the text.

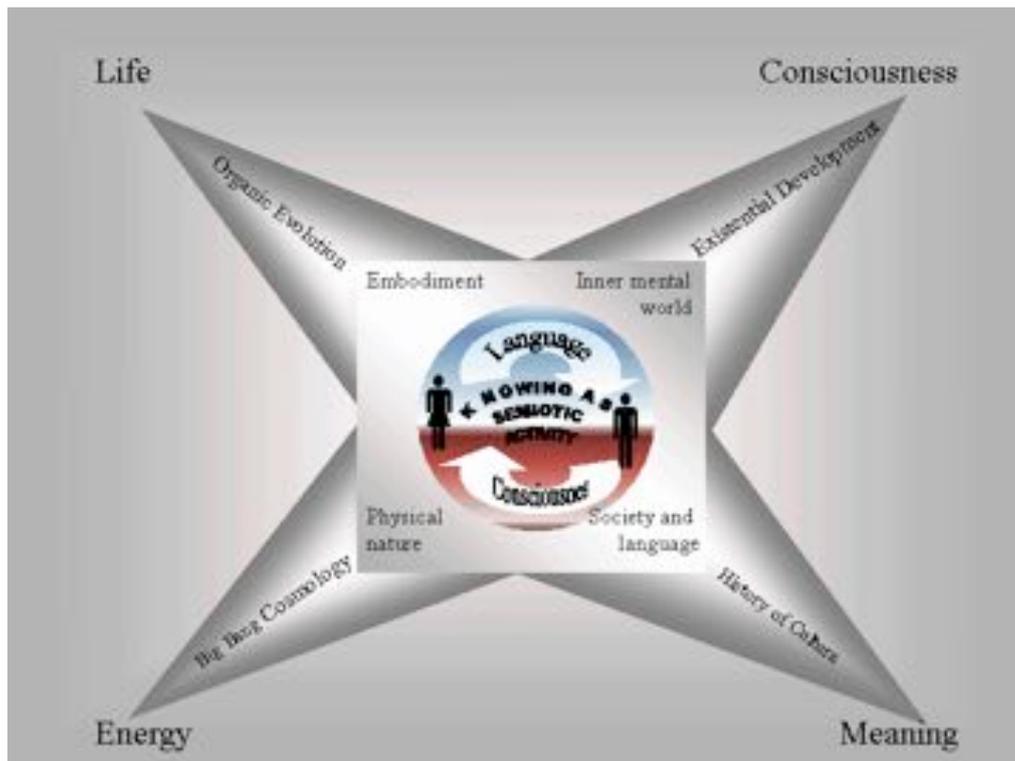


Figure 3. *The Cybersemiotic star: A model of how the communicative social system of the embodied mind produces four main areas of knowledge that can also be analyzed to be prerequisites for interpersonal observation and knowing. Physical nature is usually explained as originating in energy and matter, living systems as emerging from the development of life processes (for instance, the first cell). Social culture is explained as founded on the development of meaning in language and practical habits, and finally our inner mental world is explained as deriving from the development of our individual life world and self-consciousness. All these types of knowledge have their origin in our primary semiotic intersubjective life world of observing. (Brier 2008a)*

My suggestion is, in the spirit of rather Peirce's phaneroscopy, to start in the middle, with our daily, lived semiotic and linguistic practice. Like Peirce, I see the semiotic mind at the heart of all four worlds. The basic question in any philosophy of science that includes phenomenology at its base must be, from what or where comes the ability of the observer to produce knowledge and to reflect consciously on his knowledge in language?

The theories of the phenomenological life world and the hermeneutics of communication and understanding 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 evolution? These are matters that the exact sciences are not constructed to answer in their present state. Phenomenology and hermeneutics point out to the sciences that they have prerequisite conditions in embodied living conscious being imbued with meaningful language and 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 historical creatures, but unable to handle the aspects of meaning and conscious awareness. How can we integrate these two directions of explanatory efforts?

What makes Cybersemiotics different from other approaches attempting to produce a transdisciplinary theory of information, cognition and communication is its absolute naturalism, which forces us to view life, consciousness as well as cultural meaning as a part of nature and evolution. Thus nature is viewed as a complex manifold. Peirce's evolutionary metaphysics has a phenomenological point of departure; but he frames the task differently from Husserl (1970,1997, 1999) as well as from Hegel. Thus it is most relevant to hold on to the name Peirce invented for his own stance: *phaneroscopy*.

As the basis of that Peirce defines the three categories and connect them to the sign process, thus making a common foundation for cognition and communication, which makes his theory intersubjective at the basis.

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 1994: 1.377)

Possibility is found in Peirce's category of experience known as "Firstness", but also in the complexity science behind non-equilibrium thermodynamics and in the vacuum fields behind quantum field theory. In contrast with all other theories of self-organizing evolution Peirce's view of Firstness as both possibility and pure feeling provides organisms with the ontological conditions for any immediately felt qualitative experience to emerge in autopoietic systems. A non-reductionistic view of the cosmos would see it as an infinite being a sheer availability of potential or possible being. In short an ongoing process of becoming as Alfred Norbert Whitehead also sees it in his process philosophy. First person experience then does not come from a transcendental subject, but from the vague, pure feeling of Firstness. Thus Firstness must be the unanalyzable, inexplicable, unintellectual basis, which runs in a continuous stream through our lives and therefore the sum total of consciousness. Thus "possibility" is a good word for Firstness, which is a no-thing. Peirce equates being with Firstness. Which is clear from these two trichotomies (1) being, (2) existence/actuality, (3) reality and (1) possibility, (2) actuality, (3) necessity. Here it is important to understand the categories are inclusive. You cannot have Secondness without Firstness or Thirdness without Secondness.

Peirce's semiotics is a sort of triadic process philosophy. He is there referring to Hegel's dynamical dialectical thinking as a contrast to Aristotle. Where Aristotle's logic is concerned with separate, discrete phenomena in a deductive pattern, Hegel in his phenomenology dissolves this classical static view into a dynamic movement. This is caused by oppositions between the structural elements that - through their fight with each other - develop towards a new whole, which is usually the whole, we have now. It is viewed as preserving the former elements contradiction, but now united into a new higher synthesis. This dialectics is a much more organic way of thinking than the classical logic, which is much more mechanical. Hegel's term for this overcoming of contradiction at a new level, at the same time preserving the contradiction on a lower one, is *Aufhebung*. The concept is sometimes translated as *sublation*.

What is missing in Hegel's phenomenology from a Peircean point of view is then that healthy sense of reality that secondness provides. There is a lot of Thirdness in Hegel as well as an intuitive apprehension of the total picture, or firstness. But missing are the brute facts of Secondness, on which everyday consciousness and self-conscious experience that it does not flawlessly conform to our expectations in Peirce's analysis. We have to reflect on what the brute facts say about Thirdness and this is the road to science. Thus Hegel does not - in Peirce's view - see that the difference between Firstness, Secondness and Thirdness is foundational and there is no way one of them can be turned into the other or they can melt together into one whole.

The phaneroscopic semiotics includes an intersubjective base as Peirce considers all knowledge as intersubjectively produced through signs and view emotions and qualia as Firstness. The integrative transdisciplinary synthesis of Cybersemiotics starts by accepting two major, but not fully explanatory, and very different transdisciplinary paradigms: 1. The second order cybernetic and autopoietic approach united in Luhmann's triple autopoietic system theory of social communication; 2. The Peircean phaneroscopic, triadic, pragmaticistic, evolutionary, semiotic approach to meaning, which has led to modern biosemiotics, based in a phenomenological intersubjective world of partly self-organizing triadic sign processes in an experiential meaningful world. The two are integrated by inserting the modern development of information theory and self-organizing emergent chemico-biological phenomena as an aspect of a general semiotic evolution in the Peircean framework. This creates the Cybersemiotic framework, where evolutionary experiential and intersubjective sign processes become the ground reality, on which our conceptions of ourselves, action, meaning and the word are built. None of the results from exact science, biology, humanities or social sciences are considered more fundamental than the others. They contribute on an equal footing to our intersubjective semiotics knowing process of ourselves and the world.

It is worth noticing that the time scale is different on all four arms of the star. Phenomenological time is different from the others as a mental phenomenon that can change pace. Individual life time is usually within a 100 years, whereas cultural historical time has been different in different cultures and even in Europe redefined several times before we invented a common clock time based on the second. Historically we measure time in thousands of years which is different from the evolutionary time scale, where we measure in millions of years and finally the cosmic time where we measure in billions.

If language and consciousness is so intertwined as Wittgenstein, Heidegger, Luhmann and Peirce indicates what is a subject then, if we do not see it as an immortal soul? Peirce suggests that the subject is a symbol of the whole lived experiences of the person. But how is this to be understood and how is it connected to his philosophy of the developments of self-control and the growth of reasonability of the universe?

Peirce's three categories of Firstness, Secondness and Thirdness were intended to revise and improve Kant's. Peirce saw his categories as formal elements of the phaneron. Thus, where he criticized for placing his categories in a sort of constructivism, where we could never reach the thing in itself in our development of scientific knowledge, he sharply criticized Hegel for ignoring mathematics: "A Phenomenology which does not reckon with pure mathematics, ... will be the same pitiful club-footed affair that Hegel produced" (Peirce 1994, 5.40). For Peirce pure mathematics is essential for developing a new interdisciplinary ontology.

Peirce's phenomenology is integrated with pure mathematics. The uniqueness in Peirce's categories is that they are essentially mathematical and phenomenological concepts at the same time and as such combining the quantitative and qualitative at the root of his philosophy. Thus his aim is to construct a naturalistic but non-reductive account of the human mind, and at the same time to explain and defend the claim that the sciences are objective and realistic in their mode of inquiry. Finally with his pragmatism he wants to prove that *wissenschaft* yields knowledge of an existing reality. One of the ways Peirce wants to go here is to develop phenomenological analysis.

The observational stage regards the phaneron as a monadic reality, like in Husserlian phenomenology, where there is no distinction between the phaneron, the outside world and the consciousness and its intentionality the phenomena are present to. After this Firstness of observation there follows a generalization stage to characterize the essential elements of the phaneron. This pure mathematical is for Peirce most uniquely prior to logic. The Secondness in this trichotomy is the description of the phaneron", which forces you to "make a distinction". First it produces the dyadic quality of the objectification necessary in order to produce a

strong reliable description. This stage is pre-semiotic as well as pre-scientific. Peirce writes about the *logica utens* as virtually present in all recognitions of form essential to sense perception. It is phaneroscopy that produces semiotics in its own investigation process connecting the so-called inner and outer worlds. Peirce writes:

... there is no element whatever of man's consciousness which has not something corresponding to it in the word; and the reason is obvious. It is that the word or sign which man uses is the man himself. For, as the fact that every thought is a sign, taken in conjunction with the fact that life is a train of thought, proves that man is a sign; so, that every thought is an external sign, proves that man is an external sign. That is to say, the man and the external sign are identical, in the same sense in which the words homo and man are identical. Thus my language is the sum total of myself; for the man is the thought.

...Finally, as what anything really is, is what it may finally come to be known to be in the ideal state of complete information, so that reality depends on the ultimate decision of the community; so thought is what it is, only by virtue of its addressing a future thought which is in its value as thought identical with it, though more developed. In this way, the existence of thought now depends on what is to be hereafter; so that it has only a potential existence, dependent on the future thought of the community.

(Peirce 1994, 5.314-16)

What we are discussing here is the difference between universals⁴ and particulars. Universal laws can only be stated in terms of universal variables. The

⁴ "Universal" means that which is true of everything in a given class. Such a universal is maximally general in some sense. It is vital to the realism of Peirce's semiotics that there are real generals and not only singulars also support the reality of universals. In logic, a "universal" proposition has the form "All G is H", and a "particular" proposition has the form "Some G is H" and is not singular but merely vague as to which singular or singulars are being referred to. Some philosophers say "universals" and "particulars" where Peirce uses the concepts "generals" and "singulars" or "individuals." "There are red houses, red roses and red sunsets; this much is prephilosophical common sense in which we must all agree. These houses, roses and sunsets, then, have something in common; and this which they have in common is all I mean by the attribute of redness." Quine (1953: 9-10). The main issue with respect to our 'something' is: *whether the something may be called real*. Legg (2001). Nominalism is defined as the doctrine that everything there is, is a particular and nothing but a particular. A Realist is one who denies this proposition, holding that Universals exist. Universals are entities that are strictly identical, in different instantiations, and so are the foundations for all genuine resemblances between particulars.' Much contemporary analytic metaphysics also takes for granted that there is a sharp distinction between 'semantic' and 'ontological' questions, and that realism is a question located purely within ontology. But is there a connection? The treatment of the problem of universals and the term 'real' since the thirteenth century are intertwined. This is why Peirce subscribes to an extreme Scholastic universalism described in Haack (1992). Here universals manifest in the behavior of signs and is seen as deep habits governing future behaviors (Would-bes). Universals are discovered through the hard empirical work that constitutes science. Thus, there may be predicates in our language to which no Universal corresponds in the world.

particular, the asymmetric, the contingent are all constrained, but not determined by the universal laws. The laws are insufficient for that purpose.

Hence, this world that we inhabit does not violate universal laws, but neither is it completely formed by them. Singularities exist everywhere, but most of them are ephemeral. A few get entrained into the "habits". It is a predominately historical world wherein the "stability" we sense derives from the historical habits. In recognizing the insufficiency of universal laws, we also must acknowledge limits in our ability to predict. Abduction, or the ability to make qualified guesses is Peirce's invention and connected to the sign process as such and has to be combined with the already well-known inferences of deduction and induction. Peirce writes:

"Abduction, or the suggestion of an explanatory theory, is inference through an Icon, and is thus connected with Firstness; Induction, or trying how things will act, is inference through an Index, and is thus connected with Secondness; Deduction, or recognition of the relations of general ideas, is inference through a Symbol, and is thus connected with Thirdness. . . "

(Peirce in Turrisi 1997:276-7).

How did the first distinction of awareness come about and how did the world start is the question where religion and science overlaps. What is the connection between these two questions? Were they a one time occurrence, or are they going on all "the time"? These questions have been separated in the combination of modern science and philosophy that forms our present worldview. I hold that our deepest problem in creating a coherent worldview is how to integrate those two descriptions. Physics especially quantum physics has serious problems as how to integrate the observer within the observed. Spencer-Brown writes about this problem:

"This does not of course mean that the 'big bang' theory that cosmologists suggest for the creation of the universe is the true one. The 'explosion' into existence does not take place in time, and so from the point of view of time is a continuous operation. Thus the 'big bang' theory and the 'continuous creation' theory, like all famous 'rival' theories in western culture, are both equally true."

(Spencer-Brown 1979: 127)

Again, a view Peirce shares: evolution is creation. But many questions remain unanswered: Physically there is the interesting discussion of whether the universe has a time, since in relativity theory each system within the universe travels with its own time. But the universe is not a system in the usual understanding, as it has no

environment. Furthermore, how can we know if the time we have now is the same as the beginning of the universe. Is the first second the same as a second now?

CYBERSEMIOTIC SUMMING UP

We need to realize that a paradigm based on the view of the universe that makes irreversible time and evolution fundamental, forces us to view man as a product of evolution and therefore an observer from inside the universe made by the same principles and laws that he himself tries to discover. If we do not want to deny that man has free will then we cannot accept the concept of universal law. Peirce's vaguer concept of habits will work better in a monistic view where mind and matter has to be integrated in the same view.

This changes the way we conceptualize the problem and role of consciousness in nature compared to what Descartes did with his dualistic paradigm. The theory of evolution forces us theoretically to conceive the natural and social sciences as well as the humanities together in one framework of unrestricted or absolute naturalism, where consciousness is part of nature. This has influenced the exact sciences to produce theories of information and self-organization in order to explain the origin of life and sense experiences, encouraged biological thinking to go into psychology and social science in the form of theories of selfish genes, socio-biology and evolutionary psychology. But these approaches have still not satisfactorily led to an understanding of why and how certain systems have the ability to produce sense experiences, awareness and meaningful communication.

Thus philosophy of the social and natural sciences as well as the humanities is that all the four approaches from physics, from biology, from phenomenological awareness and intentionality, and from the sociolinguistic view are all equally important and therefore have to be united in a transdisciplinary theory of information, semiotics, first person consciousness and an intersubjective cultural social-communicative approach. At the centre of all knowledge is therefore intersubjective communicative social praxis of embodied human consciousness. The paradigm covering all aspects of this interaction and communication is semiotics combined with cybernetic and systemic theories of self-organisation and autopoiesis. The Cybersemiotic star model illustrates this; while at the same time pointing to the fact that the discussion about transdisciplinary knowledge is conducted in a linguistic discourse with other embodied and linguistically-informed consciousnesses in both a natural and cultural Umwelt and Cybersemiotics therefore presents a new form of extended transdisciplinary realism. The quarterly transdisciplinary journal *Cybernetics & Human Knowing* <http://www.imprint.co.uk/C&HK/> is a venue for scientific and philosophical discussion of this nature.

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