Cybersemiotics: A New Foundation for a Transdisciplinary Theory of Consciousness, Cognition, Meaning and Communication

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Abstract The modern evolutionary paradigm combined with phenomenology forces us to view human consciousness as a product of evolution as well as accept humans as observers from the 'inside of the universe'. The knowledge produced by science has first-person embodied consciousness combined with second-person meaningful communication in language as a prerequisite for third-person fallibilist scientific knowledge. Therefore, the study of consciousness forces us theoretically to encompass the natural and social sciences as well as the humanities in one framework of unrestricted or absolute naturalism, viewing the conscious lifeworld with its intentionality as well as the intersubjectivity of culture as a part of nature. But the sciences are without concepts of qualia; will and meaning and the European phenomenological-hermeneutic 'sciences of meaning' do not have an evolutionary foundation. It is therefore interesting that C.S. semiotics—in its modern form of a biosemiotics—was based on an evolutionary thinking and ecology of sign webs. But Cybersemiotics shows that it is also necessary to draw on our knowledge, from science and the technologically founded information sciences, systems theory and cybernetics to obtain a true transdisciplinary theory.

1 Introduction to the Scientific Problem of Awareness and Experience

When you open the skull and investigate the brain neurophysiologically and include the nerves from the sense organs and those going to the muscles, the sciences have not managed to find any qualia, experience, emotions or awareness, but only

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electrochemical impulses, transmitter molecules, hormones and functional structures of neurons, glia and muscle cells. New brain-scanning techniques make it possible to see which parts of the brain are used in what kinds of perceptions, actions and moods by following the increased blood flow to the active parts, as the brain uses a lot of oxygen. We can also induce certain feelings, moods and sensation qualities, or the memory of them, which people report orally, when we stimulate the brain electrically or do and say certain things to people. We can, through electrical stimulation of nerves, make limbs move and organs do their function. We can also from the outside register and describe the interaction between sense stimuli and behaviour in meticulous experiments with humans and other living beings as has been done since the heyday of Skinner's radical behaviourism and the European ethology of Lorenz and Tinbergen. But no matter how refined our empirical scientific approaches become, we cannot find any experiences in the brain. It does not matter if it is our own brain or that of other animals. The felt awareness seems to be found on another level of abstraction (Hinde 1970). Something central about the brain's function as an organ escapes us (McGinn 2000: 66–68, Hofstadter 2007; Penrose 1997; Searle 2007). So far, our only access to the first-person experiences is through meaningful verbal or written communication from the experiencing person (Heil 2004: 3). This is our main problem.

Among other things it means that language and culture are 'in the way'. We cannot experience other people's experiences directly. What people experience when performing certain behaviours, we only know about from their own reports, though we can see what part of the brain they use or how they behave externally as well as internally, physiologically. The paradox of modern attempts to work towards a 'science of consciousness' is that we have no direct scientific empirical access to the experiential qualities of will, intentions and meaning on which to build such a science (Edelmann 2000: xi). As a philosopher of science, it seems to me that this is why we have the qualitative phenomenological, hermeneutical and discourse theoretical methods of the humanities and the social sciences. But they are not really considered to be scientific by the natural sciences (Bennet and Hacker 2007); only the brain sciences are.

But as responsible and experientially aware social citizens, we are not identical to our brains (Edelmann 2000: 1), although we do need them in order to stay conscious. But we seem to be a more complex integrative product of physical, chemical, biological, social, mental, semiotic and communicative systems producing and produced by culture and language, of which the brain and the body surely are important components, but so is the ability of living systems to produce experience, and think about and communicate them through language. This is the problem, which some formulate as an *explanatory gap* (Thompson 2003: vii, Levine 1983).

There is no agreement on how to formulate this explanatory gap problem (Rorty 1980: chap. 1), so I will suggest a working hypothesis here: The attempt to explain consciousness from the scientific physico-chemical as well as informational and computational paradigms runs into the claims of phenomenological paradigms that our knowledge or process of knowing is based on an experiential world (what Husserl called a 'lifeworld'), prior to any culturally developed scientific explanations. His method was to attempt to put these influences in parenthesis or bracketing (Epochè) to try to get to the pure phenomena or the 'thing in itself' (Husserl 1997, 1999) through a systematic peeling away of their symbolic layers of meanings until only the thing itself as 'originally' meant and experienced remains.

Husserl's problem was that our consciousness and intentionality always are infected with intersubjective linguistic and culturally mental conceptions and ontological assumptions of the situation at hand, so in order to get to the pure phenomenon, we must seek beyond those obstacles. We thus conclude that even phenomenology has trouble getting to experience itself. This basic phenomenological position is shared by Edmund Husserl, Maurice Merleau-Ponty and Charles Sanders Peirce.[1] His development of a triadic[2] phaneroscopy is the point of departure for his semiotics.

Our gap problem is that these scientific and the phenomenological paradigms are in Kuhn's (1970) terminology 'incommensurable'. They do not have the same epistemological and ontological conceptions. They have two different maps of reality: This is my *philosophy of science working hypothesis of what is at the root of the explanatory gap*. This dovetails with argumentation by, Penrose (1997: 101) whom from his physicalistic but non-computational paradigm writes his final viewpoint, as 'Awareness cannot be explained by physical, computational or any scientific terms'.

My suggestion of a cure is to contribute to the crafting of a transdisciplinary framework—inspired by Luhmann and Peirce—wide and deep enough to contain both paradigms and thus enlarge our ontological conception of reality beyond Penrose's. I have called the framework Cybersemiotics, as it attempts to combine the two major attempts to unify theories of cognition and communication with the intersubjective, systematic and consistent systems of knowledge: (1) the informational-cybernetic and (2) the semiotics-phenomenological-hermeneutical meta-paradigms.

2 Is Consciousness a Part of Reality?

A basic problem in our culture's systematic knowledge production is that the natural and social sciences as well as the humanities do not agree on a common definition of reality. We talk about the physical, mental and social realities, but do not really know how to fit them together into a larger conception. Instead they each compete to take ownership of defining reality.

[1] I find these three authors most relevant for the problem I here want to discuss, and there are multiple references to these writers in the reference list, whom I have selected as the most interesting defenders of the phenomenological transdisciplinary view.

[2] When analysing Peirce's work, it is clear that his three categories are foundational to his whole semiotic and pragmaticist paradigm that was developed over many years. Peirce attempted to prove mathematically that triadic relations cannot be broken down to duals, but it has never been widely accepted. But I find the phenomenological argumentation very convincing and currently supported by many other developments in science. But the fundamentality of the triadic thinking has been the stumbling block for many scholars failing to accept Peirce's paradigm. But one should not underestimate how deep reflections of logic—including the logic of relations, time, reality, continuity, moment, perception and meaning—are connected to this groundbreaking invention of Peirce. Joseph J. Esposito (1980) *Evolutionary Metaphysics: The development of Peirce's Theory of Categories* describes this quest in a most profound way.

This power struggle has been a problem ever since Otto Neurath (Neurath 1983) introduced the logical positivistic idea of a unified science based on physicalism. The physical world is here considered to be the given. Critiques from the social sciences and the humanities have never stopped since. Its most alternative reaction has been to produce radical forms of social constructivism, disclaiming any kind of positivistic truth claims (Colling 2003). Most radical social constructivists consider political ideological as well as cultural conceptions of reality to be the primary reality, of which science and the phenomenological lifeworld is only one product out of many. But phenomenology from the Husserlian and Peircean traditions insists on a third view, namely, that the experiential phenomenal world is the given reality and the truth is to be found in analysing its structure, be it as intentionality schemata (i.e. the Husserlian tradition) or basic categories of cognition in the form of sign types, which are then developed into a semiotics (i.e. the Peircean tradition).

The eternal foundation that Husserl (1997, 1999) was seeking in the pure intentional structures or forms of conscious awareness became for Peirce semiotic dynamical ways of knowing that emerged through Peirce's concept of continuity (synechism) from firstness as 'may-bes' and developed into 'would-bes' in thirdness through the evolution of reasonableness:

> Once you have embraced the principle of continuity, no kind of explanation of things will satisfy you except that they grew. The infallibilist[3] naturally thinks that everything always was substantially as it is now. Laws at any rate being absolute could not grow. They either always were or sprang instantaneously into being by a sudden fiat like the drill of a company of soldiers. This makes the laws of nature absolutely blind and inexplicable. Their why and wherefore can't be asked. This absolutely blocks the road of inquiry. The fallibilist won't do this. He asks, may these forces of nature not be somehow amenable to reason? May they not have naturally grown up? After all, there is no reason to think they are absolute. If all things are continuous, the universe must be undergoing a continuous growth from non-existence to existence. There is no difficulty in conceiving existence as a matter of degree. The reality of things consists in their persistent forcing themselves upon our recognition. If a thing has no such persistence, it is a mere dream. Reality, then, is persistence, is regularity.[4] In the original chaos, where there was no regularity, there was no existence. It was all a confused dream. This, we may suppose, was in the infinitely distant past. But as things are getting more regular, more persistent, they are getting less dreamy and more real (Peirce CP 1.175).[5]

To Peirce, firstness is an unbroken continuity of pure mind or feeling, quality and tendencies to become existent in what Peirce called secondness. Thus, Peircean semiotics in its development as biosemiotics presents a third way between the natural and the social sciences.

The social sciences and humanities have felt dominated by biologistic-scientistic-reductionist explanations of experience and behaviour of human beings like Dawkins'

[3] Already before Popper, Peirce had a fallibilist theory of science. There is no absolute proof of truth in science.

[4] Which is what Peirce calls 'habits' and an expression of his category of thirdness.

[5] As convention goes, this refers to Peirce, C.S. (1994), which is the collected paper (CP).

(1989) selfish genes, memetics (Blackmore 1999) and E.O. Wilson's sociobiology and his later attempt to make a unified view from it (Wilson 1999). What this reductionist meta-scientific paradigm is supposed to mean is most clearly spelled out in Edward O. Wilson's *Consilience: The Unity of Knowledge* (1999). Taking up the torch from logical positivism, Wilson predicts that most of the humanities will be replaced by hard scientific knowledge, just like neuroscience will eventually tell us what conscious experience is. Consilience, literally a 'jumping together' of knowledge, has its roots in the ancient Greek concept of logos, which is the vision of an intrinsic orderliness governing the Cosmos. The problematic view, much science and analytic philosophy has inherent, is that logos is comprehensible by formal logical processes only. A reason to believe that Peirce's semiotics can move us out of this predicament is that he combines his view of semiotics and logic in an evolutionary pragmaticist framework. He writes:

> 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.[6]
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> (C.S. Peirce 1980: 20–21 & 54.)

For Peirce, pure mathematics is more fundamental than logic, and in combination with phenomenology is the foundation of his metaphysics, as we have already shown. This view clashes with the received view of science, which does not include phenomenology. As a function of the 'logos and unity of science' view, the received mathematical and deterministic version of science (Penrose 1997: 2) denies the validity of all claims and practices other than its own. In this way, it turns science into a kind of war machine, destroying all other discourses and points of view, a tendency which the physicist and philosopher Paul Feyerabend (1975) was aware of. The same critique applies to the information and computer science-based cognitivistic explanations of human social coordination and communication (Brier 2008a). But natural science was confronted by the social sciences in what is called the 'linguistic turn' in philosophy of science and various forms of constructivism, from solipsistic radical ones to social constructivisms (Brier 2009a), all undermining the objective authority of science's explanations of how the world works. This ignited what has so often been called the 'science wars', of which not much good emerged aside from a realization among some researchers of the necessity to construct a new integrative transdisciplinary framework, in which all can work together in a fruitful way.

[6] Peirce considered pure mathematics to be a more fundamental discipline than logic. According to Peirce, logic comes from mathematics and not the other way around as some researchers and philosophers believe. His thinking seems to be close to that of Penrose (1997) here, but the semiotics Peirce creates is beyond anything imagined in Penrose's paradigm.

Nicolescu (2002) is one of the rare examples of a quantum physicist engaged in a non-reductionist transdisciplinary philosophy of Wissenschaft.[7] One fact that has been emerging from the science wars with the social sciences and the humanities is the realization that the natural sciences were dependent on the language they were formulated in and that language, world view and mentality are deeply interconnected. Thus, we are back to Neurath's basic ideas, since we have given up on the idea of a special objective scientific language combining logic and mathematics to unite all Wissenschaft. Thus, theories of language, cognition and conditions for signification had to be integrated into the interpretation of scientific data. This is another reason for introducing Peirce's semiotics (Peirce 1931–1935), which was a research project mainly conducted from 1865 to 1910 in order to provide an understanding of the logic of scientific method. The result was his semiotic, phenomenological and pragmaticistic view of knowledge aimed at providing insight into the methodological commonalities found in all attempts to produce scientific knowledge, or what one could formulate as the semiotic processes of science. The project ended as a semiotic paradigm with a new transdisciplinary ontology and epistemology. As Emmeche writes:

> A logical implication of the ontological-phenomenological basis of Peirce's semiotics … points to an interesting continuity between matter, life and mind, or, to phrase it more precise, between sign vehicles as material possibilities for life, sign action as actual information processing, and the experiential nature of any interpretant of a sign, i.e., the effects of the sign upon a wider mind-like system.
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> (Emmeche 2004: 118)

The problem of explaining the awareness of sensory information and its qualia, how we come to interpret sense experience and how it is connected to subjectivity is also a problem at the basis of philosophy of science, as well as questions of truth and meaning and how science is placed between them or may contribute to integrating them.

3 Philosophy of Science's Problem of a Science of Consciousness

Thus, the hard problem of why we have qualitative phenomenal experiences is not a superficial question; rather, it is one that demands that we dig deep down into the prerequisite for our way of producing knowledge, world views and explanations. Bennett and Hacker (2007: 4) underline that

[7] 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 wells 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.

> Conceptual questions antecede matters of truth and falsehood. They are questions concerning our forms of presentation, not question concerning the truth or falsehood of our empirical statements… when empirical questions are addressed without the adequate conceptual clarity, misconceived questions are bound to be raised, and misdirected research is likely to ensue… any incoherence in the grasp of the relevant conceptual structures is likely to be manifested in incoherence in the interpretation of the results of experiments.

Thus, in this chapter, I will suggest a way to deal with these problems through a philosopher of science's reflection on the limitation of coherence and consistency in our generally accepted but specialized epistemological and ontological frameworks in the natural, life, information and social sciences as well as the humanities.

The first move towards constructing a transdisciplinary framework (or meta-paradigm) including the natural sciences, phenomenology and a paradigm of semiotic-linguistic constructionism is to accept that natural, life and social scientific knowledge as well as knowledge in the humanities is created in intersubjectively meaningful communicative action by embodied living systems and that we are unable to give any final proof of its truth. This is in accordance with Popper's (1972) and Peirce's (1931–1935) idea of fallible objective knowledge. This view is also based on the fact that meaningful intersubjective communication is still—like first-person consciousness—not yet scientifically explainable or technologically realizable in meaningful linguistically communicating robots. Furthermore, we need to be aware that the life sciences have their own perspective, which we also need to integrate, since all the conscious beings we know today are embodied in living, autopoietic systems. No computers, AIs or robots can produce conscious awareness presently. AI is still not AC (artificial consciousness).

The intersubjective and the autopoietic embodied subjective awareness of differences that make a difference combined with semiotically based communication is a prerequisite for all intersubjective productions of knowledge. All scientific knowledge demands embodied minds meaningfully sharing interpretation of sense experiences through signs. Robots do not make science on their own, only as tools for humans, because they do not have experiential bodies.

Meaning is thus in a way created before and outside the realm of natural science, as we know it today. Meaning is primarily dealt with in ordinary social language and its paralinguistic bodily influenced signals. The subjective and intersubjective cultural meaning is explicitly removed from the foundational framework of the classical positivistic influenced concept of science for its strive towards knowledge of universal character mostly in the form of deterministic or statistical laws. In order to obtain objectivity in the empirical sciences, it is usually taken for granted that one must remove any influence of the subjective and cultural ideas of reality. This fact presents one aspect of the problem of a scientific explanation of consciousness, as subjective awareness and meaningful communication are not really deeply reflected in the concept of scientific objective knowledge. Heelan (1983 and 1987) has spent a lifetime investigating and arguing for the relevance of hermeneutics and phenomenology for the understanding of scientific observation and the interpretation of data, which is also the main point of Gadamer's (1989) main work.

4 Integrating the Four Views on Consciousness in the Cybersemiotic Star

Cybersemiotics suggests then that we have four different approaches to the understanding of cognition, communication, meaning and consciousness. First are the exact natural sciences. Second are the life sciences. Third are the phenomenological-hermeneutic interpretational qualitative 'sciences'. And forth is the sociological discursive-linguistic cultural view. We are here inspired by Wittgenstein's (1953) pragmatic linguistic view, but not only that. The point in the Cybersemiotic paradigm is that it views the production of knowledge from the middle, where we, as embodied, are aware of semiotic and communicating living systems and create knowledge in a cultural and ecological surrounding. This means that we cannot attribute more importance to one of the four systems of knowledge than any of the others without committing a reductionism or an unfounded one-sided simplification of reality. Thus, the four approaches are all equally important. This philosophy is parallel to Bruno Latour's break with modernity in his book *We Have Never Been Modern (*Latour 1993) and also inspired by Merleau-Ponty (1962). I work with four main paradigms, where Latour works primarily with the dichotomy between nature and culture.

In Latour's actor-network theory (ANT) and philosophy of science (Latour 1993, 2004), explaining consciousness only through the brain as a natural entity is nearly an impossible idea because what are considered 'natural entities' by science, for Latour, are 'hybrids' and they achieve their existence for us through a semiotic network of actants. But Latour does not deny that they have a 'Ding an sich' existence as independent reality. We should not forget that Bruno Latour's (1993 and 2004) theory of hybrids and actor-network theory are based on a semiotics, inspired by Greimas' actant model that is a semiotic combination of material existence and social role as created by a narrative. Latour views science as one narrative of the working of nature among many possible narratives based on the data we have so far. But not all stories about nature have been shown to be viable. Latour's view is thus of a semiotic processual kind. Its semiotics is not really a Peircean version (Brier 2008b), but a special brand of Saussurian semiology developed by Greimas and further formed by its inclusion in Latour's realistic vision of a communicative/semiotic network of humans, things (including technology and cultural artefacts), living and dead natural entities we relate to and which are organizations in the way that they act back on the social and change it (the HIV virus is an example) (Latour 2007: 10–11). Despite the fact that many call Latour a social constructivist and a postmodernist, he insists on being a realist and that the normative view of ANT is that it should contribute to a better social order, not to breaking things down (Latour 2007). This places him closer to Peircean semiotics than Saussurian semiology.

Science is a cultural product. It is a technology that we use in order to see, understand and manipulate the natural world on which our existence is dependent. The tool of scientific discourse based on empirical investigations makes us able to describe the part of reality we need to handle and in that process ascribe meaning to it and its processes. That certainly does not mean we are able to describe all of

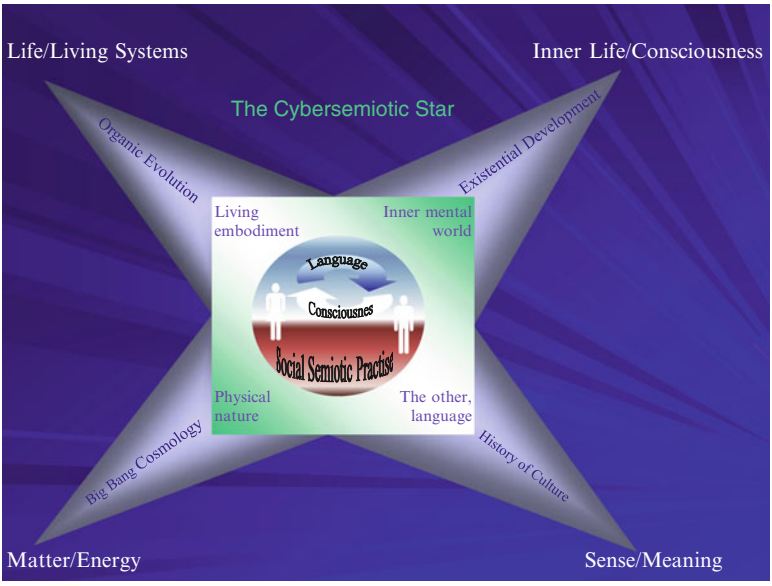

Fig. 1 The Cybersemiotic star: A diagram of how the communicative social system of embodied minds' four main areas of knowledge arises. Physical nature is usually explained as originating in energy and matter, sometimes also information, living systems as emerging from the development of life processes (such as the first cell). Social culture is explained as founded on the development of meaning and power in language and practical habits, and, finally, our lifeworld is explained as deriving from the development of our individual lifeworld and consciousness. In spiritual and religious frameworks it often ultimately conceptualized as originating from an objective transcendental spirit or as a soul coming from a personal creator or God

nature or give consistent meaning to all we have described so far, such as the relation between brain, culture and consciousness.

The idea of Fig. 1, called the Cybersemiotic star, and the epistemological turn it is illustrating is to escape the great explanatory burden of reductionistic mainstream science, which aims to explain both life and consciousness from its basic assumption of energy and mathematical mechanistic laws. The Cybersemiotic philosophy of natural, life and social sciences as well as humanities sees their different types of explanations moving from our present state of sociolinguistically common-sense-based conscious semiosis towards self-organized and highly specialized autopoietic knowledge systems. Each of them develops towards a better understanding of the prerequisites of language, culture and our self-conscious subject, and their production of systematic knowledge in a time perspective.

There are four forms of historical explanations invoked here: (1) the cosmological (physico-chemical), (2) the biological (biosemiotics and biosciences),[8] (3) the historical (sociocultural) and (4) the subjective perception of a lifetime, or experienced time.

[8] Cartwright (1997: 165) and Shimony in footnote in Penrose (1997) also argue for the independence of biological knowledge.

The *Cybersemiotic star* illustrates the equal importance of the four basic approaches, and from the model a few other points can be made. To be a realist about the possibility of science giving us usable knowledge about reality is to accept the reality of language, autopoietic embodied minds, culture and noncultural environments as well as the idea that our knowledge springs from processes of interaction between them. But that is something quite different from believing in reductionist explanations from one of the arms of the star. I agree with Steffensen and Cowley that we must move towards a much more nonlocal understanding of mind. What they call '…a transdisciplinary non-local approach to bodily, cognitive and interactional processes' (2010: 348).

The natural sciences work towards making one grand cosmogenic explanation.[9] But so far we have not cracked the problem of the emergence of life and consciousness in evolution, so until that happens, we might have to accept that an all-encompassing explanation of the meaningful conscious communication process cannot be provided from any one of the corners of the model alone. I argue further for this in the rest of the chapter. As we cannot reduce our scientific explanations to one grand story and claim it to be the one and only reality, my theory is that we have to juggle and work with all four types of knowing at the same time. This puts us in a new situation and changes the research questions about consciousness, as I will argue for further in the rest of this chapter.

The reason science works on the assumption that the physical world has no sense experience or meaning at all, but only natural laws,[10] is that scientists are brought up to think that to indulge in the opposite ontological assumption would make our search for knowledge religious or political, as these are the two major meaning-producing systems we know. Science fought its way out of the powerful grip of religion in the Enlightenment and later out of totalitarian political ideologies like Nazism and Communism.

Steering clear of religion and political world views, what are we then to call the meaning interpreting disciplines in the social sciences and humanities? This problem is well-known, and answers have been developed within phenomenology, phaneroscopy (Peircean triadic semiotic phenomenology) and hermeneutics, the ultimate philosophical version of which was developed by Gadamer (1989). Gadamer's book is clearly developing a philosophy for the humanities and the qualitative social sciences. Are we then going to accept meaningful interpretation as part of our view of consciousness and legitimate objective knowledge? I cannot see how we can ignore this fundamental human process of cognition, since meaningful human communication is a prerequisite for the possibility of science. If we want to give scientific answers about the nature of consciousness, we must integrate some version of hermeneutics into a transdisciplinary theory of knowing.

[9] But George F.E. Ellis (2004: 622) also accepts that there are four different worlds, though his fourth is mathematical abstract reality and not linguistic intersubjectivity.

[10] A conundrum described in 1944 by Schrödinger (1967/2006: 163) in his *What is Life?* which was first printed in 1944.

In this case, we need to move from talking about a science of consciousness to calling what we deal with a *Wissenschaft* of consciousness, as this German concept includes natural as well as social sciences and humanities in a single concept. Thus, my perspective on the explanatory gap will conclusively be: *What would the consequences be of looking to the results of the behavioural and brain sciences for an understanding of mind and consciousness from an integrated Wissenschaftliges perspective?* Can we view qualia and meaning as coming from the culturally embodied distributed linguistic mind and understand it in a grander scientific, evolutionary and ecological view?

This is where I think only a Peircean biosemiotics can answer 'yes'. A realistic and pragmatic conceptualization of sign processes in all their variations could be seen as the unitary phenomenon that connects all living natural systems with human cultures and furthermore distinguishes them from inanimate nature. It could serve as the framework that provides the human, social, engineering, business, life and natural sciences with a common theoretical basis for empirical research. Peirce's realism is, among other things, based on his belief in secondness, or the unexplainable random fact. There are immediate differences and resistances between phenomena or different things (haecceities). Peirce adopts Duns Scotus' term *haecceity* to designate the arbitrary here-and-now-ness of existence, a person's or object's 'this-ness', that is, the brutal facts based on relations. *Peirce* identified this haecceity as 'pure secondness'. Peirce's view of haecceities as being unexplainable as singular events is close to the modern understanding of quantum events. It is interesting that quantum physics has realized that it cannot explain the singular event either; it can only make a probability model from thousands of them, describing the thirdness of the phenomena. There is an undetermined spontaneity of the single event that is not explainable in itself from a scientific point of view (Stapp 2007).

So how does the mind collect all these haecceities to one quale experience? One way of formulating this question is in the form of *the binding problem*, widely discussed in brain and consciousness studies (Chalmers 1996). It asks how the unity of conscious perception is created in the neurological processes that make up the central nervous system. Thus, two unsolved aspects of the phenomenon of conscious awareness are the mechanisms and laws that produce the *unity of conscious perception*. Physiologically we can ask, how do we create a unified percept from the input from many separate neuronal systems? But phenomenologically we must also ask how does the unity of conscious self appear, as it seems to be the background for our judgement of singular experiences, not produced as the sum of them.

Some researchers see this as only a neurophysiological question, but in fact it is a question that demands types of answers that extend beyond the realm of physical science alone, since it concerns meaningful subjective and intersubjective experiences that point beyond physical explanations. Searle defends the view 'that consciousness consists of unified, qualitative subjectivity, caused by brain processes and realized in the brain' (2007: 102). In that case, how do we integrate all those different perceptual inputs from inside and outside the body into a lifeworld or a conscious horizon, with ourselves in the centre? The question from science should

be, *How can we systematically work with any reality beyond the physical?* It is a foundational philosophical problem prior to any empirical science.

Peirce's whole semiotic philosophy of science is an answer to this question, as he believed that nominalism and derivatives of it like sensationalism, phenomenalism, individualism and materialism all based solely on secondness were a great threat to the advancement of science and civilization. His semiotics was a nuanced realism in which he distinguished reality from existence in a way that allowed him to admit general and abstract entities, which he conceptualized as belonging to thirdness, as reals. He did that without attributing to them direct physically efficient causal powers, but these non-existent reals could influence the course of events by means of final causation.

It is crucial to Peirce's semiotic realism that thirds are as real as firsts and seconds. They are connected through the semiosis that carries scientific knowing. Thus, the argument does not need to lead to the introduction of elements or worlds outside nature in the way in which Cartesian dualism, for instance, can be interpreted to do in its postulation of a *res cogitans* (i.e. a thinking substance). Signs are relations. The ontological idea is not placing consciousness and the world of thought outside nature in a special mental world. The idea, rather, is to expand our ontological views of living nature to a biosemiotic-based interdependent thinking of lived sense making (Cowley et al. 2010).

Husserl's work and Gadamer's hermeneutical philosophy (Gadamer 1989) are attempts to give another more comprehensive model for reality, including the sciences as well as a theory of understanding, communication and history of culture. Gadamer's theory of interpretation and understanding goes through pre-understanding and the process of the hermeneutical circle in order to integrate parts of interpretation, as well as the subjects' and the objects'[11] horizons. His view is that truth does not spring automatically from using one type of method and naming it 'scientific' or 'mathematical-logical' or 'empirical' or a combination thereof. One has to reflect on the horizon from which one produces knowledge. This is done in order to create understanding in the form of fusing knowledge and experiential horizons (Heelan 1983, 1987) for all living beings with conscious awareness. Thus, consciousness in the form of awareness and the ability to have sense experiences need to be conceptualized within an understanding of a natural reality bigger than physics, unless one wants to deny that animals have sense experience and deny that our own animal body is a prerequisite for self-consciousness. We will therefore assume that consciousness, matter and signs are coexisting in, or comprise, nature as well as culture.

To go one step further, we might add the work of David Chalmers. Chalmers (1995: 201–202, 1996) is well-known for defining what he calls *the easy and the hard problems of consciousness*. The easy problem has to do with the inner workings of consciousness, such as the ability to discriminate, categorize and react to environmental stimuli; to be able to report mental states by accessing internal states; and

[11] Which can be another subject's mind, an artefact, a piece of art or a text.

to focus attention, deliberately control behaviour and distinguish between mental states. *The hard problem*, which is the one we are speaking about here, has to do with solving the problem of how sense experiences and their different qualia—such as pleasure and pain, sweet and sour, colours, and mental images—emerge from physical brain and body matter. That is the problem we are dealing with here in a naturalistic and therefore also evolutionary framework. Thus, our question now can, align with Chalmer's, be stated as: How can the ability to experience emerge from, what science presumes to be a material world?

This very question is asked by Colin McGinn (2000) in his famous book on consciousness: *The Mysterious Flame: Conscious Minds in a Material World*. McGinn is sceptical towards our ability to explain the phenomenon of consciousness, at least with our present vocabulary. How it is possible in a natural world, which we so far have defined as 'material', to 'feel like someone' in the way it is framed in Nagel's famous article, 'What is it Like to be a Bat?' (Nagel 1974), or to experience the sight qualities of, say, red or blue? The problem of explaining and modelling in a scientific way the ability to experience qualitative differences in sense experiences is formulated as the question of qualia (Jackson 1982).[12] How do nervous systems produce sense experiences? But opposing the importance of qualia are functionalistic philosophers. They argue that in understanding the function of a system, it is not its materiality or its experiential quality that matters. There is no reason to give causal powers to experience. This often leads to the assumption that computers have minds (Harman 1990). But it is important to note that this functionalist view of mind is then not the experiential mind I speak about herein.

Another handle on the problem of the limitations of computers for our theories of experiential consciousness is Roger Penrose's work (1989, 1994, 1997) in which he shows that even in mathematics, human minds are capable of non-computable or non-algorithmic processes that go beyond the present capabilities of computers. Based on this observation, my position in this chapter will be that only *aspects* of mind processes can be simulated by computers or algorithms, since most researchers presently agree that computers—as we presently know them—cannot compute awareness, qualia and meaning.

Based on Peircean biosemiotics (Brier 2008b), I side with Searle (1980) and Penrose (1994, 1997) against the view of hard AI that symbol manipulation in itself is the core of intentionality. I fail to see how automatic symbol manipulation in computers has anything to do with the production of intentionality and qualia. Jackendoff (1987) has very precisely framed the problem in the form of the concept of *the mind-mind problem*. I agree with him, when he formulates the gap problem as the relationship between *the computational* and the *phenomenological mind*! As the philosopher Nagel (1986: 259) also points out:

[12] The question of what 'it' is denied by Bennett and Hacker (2007) as a wrong type of question in their Wittgensteinian-inspired pragmatic linguistic theory of mind. But I side with Searle (2007) on this problem that we cannot define the ontological dimension of this problem away.

> If we try to understand experience from an objective viewpoint that is distinct from that of the subject of the experience, then even if we continue to credit its perspectival nature, we will not be able to grasp its most specific qualities unless we can imagine them subjectively.... Since this is so, no objective conception of the mental world can include it all.

Thus, if we do not believe that the brain is just a computer and that informational computation is what creates consciousness in the human body, then it must be something else. Searle (1980, 1989, 1997 and 2007) argues that it has something to do with our biology. Consciousness and intentionality must be biological products. The secret of consciousness is also the secret of life, one could say.

The tragedy is that biology so far has only been able to give functional definitions of life. Searle (1980) believes that the brain's production of intentionality is like chlorophyll's production of carbohydrates through photosynthesis. Boden (1990) in a critique points out rightly that experience is a qualitatively different product than carbohydrates. We can describe and measure carbohydrates scientifically, but this is not the case with the quality of experience. As far as we know today, only living bodies can produce the awareness necessary for having experience. To live is to experience! *But the living, experiencing flesh is still a mystery to the physico-chemical sciences as well as to the life sciences in their present non-semiotic form,* as Merleau-Ponty (1962, 1963, 2003) thoroughly argued from the philosophy of embodied phenomenology. As experience is a prerequisite for science, science may not be able to explain it.

Still we must conclude that consciousness has an inescapable biological component. Consciousness is (also) a feature of the brain. But as Favareau (2010: vi) points out, if this is the case, then what we considered the *one* central problem is rather a triplet: 'What is the relation between mental experience, biological organization, and the law-like processes of inanimate matter?' This is at least how biosemiotics, which analyses the processes of life from a semiotic viewpoint in addition to the physico-chemical view, sees it. Scientific biology in the form of physics, chemistry and physiology is unable to describe important aspects of the processes of living systems. The suggestion here is that we supplement our physico-chemical knowledge with a semiotic view.

As a mode of inquiry into the psychological activities of the human brain, semiotics has always sought to investigate and develop models of how the mind extracts meaning from physical forms through interaction, as well as the way in which such forms can stand for something else. Biosemiotics, including human and cultural semiotics, can be defined as the study of how meanings are created in living systems between signs and the information they encode in the perceptual and cognitive apparatus (Hoffmeyer 2010).

The realization that the embodied cognitive apparatus in humans is developed in evolution has given rise to biosemiotics as the field investigating how different species transform sense experience into perceptual schemas through species-specific semiosis. As a consequence, it has become evermore obvious that sign study cannot avoid biological considerations. As one of the contributors to biosemiotics, I find that, especially in its stringent Peircean formulation (Brier 2008b) with its triadic

phaneroscopic categories, the field represents a promising way out of dualism, monistic eliminative materialism and other sorts of physicalism and informationalism, as well as radical forms of constructivism.

Favareau's way of formulating the gap problem is, interestingly, a bit broader than asking how brains produce minds, as it broadens the field from specifically *human* physiology to evolutionary and ecological semiotics and the (comparative) psychology of all living systems having the ability to experience and communicate aspects of their environment.

Such a paradigm was originally formulated as *Umweltlehre* by Jacob von Uexküll (1982, 1934) and later, inspired by him, as *ethology* by Konrad Lorenz (1970–1971) and Niko Tinbergen (1973) (see Brier 1999, 2000a, b, 2001). Connected to these questions is also the problem of how living systems perceive sense experiences and communicate in the frame of *meaning* and why and how they seem to have intentionality. Furthermore, it is a scientific enigma how signs and the grammatically ordered symbols of language can evoke feelings, qualia and images from the body. How can individual emotional purpose such as a love through a poem enter the nervous system of another human and create semiotic interpretations in the form of feelings? What is the physical causality? How can free will have causal influence on, for instance, the movement of our bodies, when physics believes that causality is primarily based in initial conditions and universal mathematical laws (Penrose 1997)?

In the world of matter, energy and objective information—as the natural scientific paradigms presently see the basic ontology of nature—no meaning as such is supposed to be found. But then how can the life sciences, of which biology is the most prominent, avoid working with the reality of emotions, intentionality and meaning? This is a problem Konrad Lorenz struggled with over 30 years (Brier 2008a; Lorenz 1970–1971) and could not solve within the natural scientific paradigm. As Hinde (1970) argues, biology is not able to encompass the psychological 'level of existence' or, to be more Wittgensteinian, 'description'.

The point is, again, that if biology is to encompass the felt experience of animals, its foundation has to differ from that of physics and chemistry. Current biology is therefore not enough. As Hoffmeyer (2008) writes, 'scientific description in gene-fixed reductionistic biology, exclusively deals with phenomena that may be described in the language of third-person phenomena, and thus … excludes this science from arriving at a theoretical understanding of the human biosystem as a first-person being' (Hoffmeyer 2008: 333–334).

Thus, we need a Wissenschaft, which includes a theory of signification and meaning, which is exactly what biosemiotics attempts to do. Emmeche (1998, 2004: 118) writes, 'The semiotic approach means that cells and organisms are not primarily seen as complex assembles of molecules, as far as these molecules – rightly described by chemistry and molecular biology – are sign vehicles for informational and interpretation processes, briefly, sign processes or *semiosis*'.

But this view is not a possibility for energetic, molecular or even informationally founded biology. Kull (2009) discusses what this kind of Wissenschaft biosemiotics could and should be and suggests a qualitative modelling science he calls

Sigma-science after Vihalemm (2007). In the humanities there are dominant paradigms designed to analyse human qualitative and intentional consciousness, culture and language. These include phenomenology, hermeneutics, linguistics, rhetoric, discourse and cultural analyses and semiology. The humanities deal with the world of meaning as produced by humans in society through language, art and social interactive practice. But if you ask contemporary researchers in the humanities what the *ontology* of meaning is, they usually answer, 'it is just a social and cultural construction', as if that was not real and not also biologically based! But on the other hand, most do agree that the social world, held together by communication, power and institutions, is the dominant reality we live in.

The reality of social phenomena is surely something other than physical reality, but the social world of meaning and values is real, and interactions in it can be described systematically, as Max Weber showed in his research method of ideal types, exemplified most famously in *The Protestant Ethic and the Spirit of Capitalism* (Weber 1920). Social constructivists can only give answers within the historical time frame of hundreds and up to thousands of years. Biological evolution is not part of their paradigmatic framework, since in the biological evolutionary viewpoint, meaning has a history of millions of years in the development of embodied living systems. This is the story biosemiotics attempts to tell, since the sciences are not conceptually equipped to do it (Emmeche 2004). Thus, we should encompass the social as well as the individual experiential reality and their history in nature. But how are we going to connect them? Where to put the brain in experience?

Chalmers' *The Conscious Mind: In Search of a Fundamental Theory* (1996) collects nearly all the material in science and philosophy we had on the subject at that time, except Peirce's semiotic philosophy. His suggestion of a solution is a type of double-aspect theory, where the experiential is the inside of information in the brain. But viewing objectively defined information and experiential meaning as two aspects of 'the same' does not solve the deep troublesome problem lying in the obvious observation, that I am not my brain and that emotions like jealousy can make a person murder the one he/she loves. The murderer is not his/her brain but him/her. One should not commit the mereological fallacy to contribute to the part that which only makes sense when attributed to the whole. It is not the brain that experiences; it is embodied human persons in a culture with a language (Bennet and Hacker 2007; Cowley et al. 2010). But the person seems to be a biological, psychological as well as a social and linguistic product—a wholeness not reducible to the brain.

My brain is part of me. So who or what is phenomenological me? Am I the nonmaterial linguistically informed product of my brain? Is it then possible that conscious awareness and experience are something we are missing in our scientific explanations of living systems such as perception, cognition and communication as we know them? For instance, dark matter and energy were missing in early cosmological descriptions of the universe's evolution. They were concepts later introduced because we were lacking something to harmonize what we observed astronomically with the physical laws we had developed. What we saw and measured did not fit

with the laws we believed were universal. After introducing the new aspects of physical reality christened 'dark energy' and 'dark matter',[13] what we before had considered being the whole of material reality, now showed to be 3–4% of the whole (Bertone 2010). Thus, a revolutionary new cosmology was created by introducing new ontological elements.

The parallel I am arguing for is that it might turn out that what we now consider the material reality of biological systems is just a small percentage of the whole of living system because we missed something vital for the functioning of living systems! Namely, signs and sign functions.

In the context of the social sciences, we know that we are consciously experiencing a world through processes that are unconscious for us. We do not know what we do when we see, feel, intend and act accordingly. But most cultures and societies hold their citizens responsible for the actions they take from their interpretation of sense experience. Materialistically based evolutionary and ecological theory forces the question that if culture comes out of nature, *how do experiential subjects emerge from an objective world*? Here, I am not thinking about research, which accepts the experiential aspect of life in the living and therefore describes how it has developed through evolution like Donald (1991, 2001). He describes the evolution of consciousness and its forms from a biopsychological platform. Sonesson (2009) bases his work on phenomenology, Piaget and aspects of Peircean semiotics. The work of Zlatev (2009a, b) uses aspects of Peircean semiotic terminology, but not his ontological foundation, in an evolutionary framework. Nor am I thinking of Deacon (1997) or his later articles (2007, 2008), which stray away from a Peircean foundation. None of these works attempt to solve the hard problem.

Thus, in my view, a pure materialistic and scientistic theory cannot answer the question I am asking, because it cannot describe the feeling of being aware or the phenomena of experiencing qualia, will and intentionality. Such theories can only describe physiological and behavioural consequences. Thus, the philosophy of ontological reflection going beyond physics and scientific knowledge in general seems to be required because the unity of conscious experience—in spite of the numerous neurophysiological systems—that underpins it does not really have a physical scientific meaning. It can have a social meaning, since we talk about it, based on our interpretation of others' behaviour in the belief that they have inner mental states with causal powers over their behaviour.

[13] Wikipedia writes, 'Dark matter came to the attention of astrophysicists due to discrepancies between the mass of large astronomical objects determined from their gravitational effects, and mass calculated from the "luminous matter" they contain; such as stars, gas and dust. It was first postulated by Jan Oort in 1932 to account for the orbital velocities of stars in the Milky Way and Fritz Zwicky in 1933 to account for evidence of "missing mass" in the orbital velocities of galaxies in clusters…. According to consensus among cosmologists, dark matter is believed to be composed primarily of a new, not yet characterized, type of subatomic particle'.

5 The Idea of Cybersemiotics

The transdisciplinary frame for information, cognition and communication science called Cybersemiotics (Brier 2008a, b, c, d; 2010a, b) is an attempt to show, using Peircean Biosemiotics, how to combine knowledge produced in the natural, life and social sciences and the humanities, as each describes an aspect of consciousness.

But first we have to deal with the incompatibility between the two transdisciplinary paradigms attempting to create a theory of consciousness. With an expression from Kuhn's (1970) paradigm theory, the two paradigmatic theories on thinking and communication suffer from incommensurability. The first paradigm is cybernetic information theory and cognitive science, which is actually a technologically oriented paradigm that has a background in a scientific, materialistic and mathematics or logic, as a more abstract and general part of nature, metaphysics.

Many members of this world view have the deep problem that they usually do not consider their views to be founded on metaphysical postulates at all, but only common-sense reality. Therefore, they do not want to be drawn into 'metaphysical speculation' or philosophy. Many people have the misconception that modern physics deals with the world as we know it in our daily life. Nothing can be further from the truth. Quantum field theory and the special and general theories of relativity, super string theory and black holes, dark matter and the like are totally outside of our common experience. If you ask people to interpret everyday physical processes, most of them give explanations close to Aristotelian physics. Thus, the majority of human beings have not even moved into a Newtonian paradigm, let alone Einstein's, Bohr's, Feynman's or Hawking's. Modern physics has no direct bearing on our awareness, meaning or common sense. Still to this physicalistic world view, many researchers of the World War II era inspired by cybernetics attempted to add information and computation to explain the emergence of conscious awareness.

Cyberneticists built an expanded new world view by adding the concept of information to energy, space, time and force and imagining that all natural processes including consciousness and emotion could be fruitfully described and understood in a grand theory of natural computation (Dodig-Crnkovic 2010; Dodig-Crnkovic and Müller 2011). This pan-computational/pan-informational project is an interesting scientific endeavour as such, but I fail to see how it will ever be able to solve the experiential and qualitative aspects of conscious feeling and experience as it lacks the experiential aspect of reality. As mentioned above, Chalmers (1995) attempts to solve this problem with a double-aspect ontology in such a way that he can keep the mathematical foundation of information theory and still get the experiential aspect at the same time. But I do not think he has any good arguments for how this should work, and he misses the meaning process dynamics, which is inherent in Peirce's semiotics. Thus, like Peirce, I want to expand our wissenschaftliges concept of reality. I do talk about not only that aspect of it that can be described by physics (often reified as the physical world, turning an epistemological concept into an ontological one and reifying it) but also what can be described by the life sciences, communication sciences and

psychology. Thus, reality includes at least a material environment, a living body, a lifeworld of experience and a social communicative world all necessary to produce experiential knowing. Science is based on intersubjectively well-functioning communication in a field of meaning, coordinating knowledge and practice in the real world. I am therefore asking what kind of transdisciplinary ontology and epistemology we need in order to construct the theory of a evolution of meaning and conscious lived experience that is coherent with the natural, life and social sciences.

6 Phenomenology and the Lifeworld

What is then the rational basis of my insistence that the physical aspect of the world is not the paramount foundation of reality? It is basically acceptance of the main point of the whole phenomenological movement, the history of which Spiegelberg (1965) has made a highly recognized exposition of, including Peirce. We will not go into that grand history here, but many researchers take their departure from the work of the father of modern European phenomenology, Husserl (1970, 1997, 1999), and the father of the American variant called phaneroscopy, namely, C. S. Peirce (1931–1934), who is also the father of the pragmatic, triadic transdisciplinary semiotics, upon which much of biosemiotics is being built.

Husserlian phenomenology claims that the so-called *lifeworld* is a unit of reality before science splits the world into subjects and objects or interior and exterior. The dualism of subject and object is really not essentially relevant for the phenomenological paradigms, which, like hermeneutics, claim to deal with the cognitive processes that are prerequisites for the invention of science in our cultures. This is the area where the philosophical grounding for the natural, life and social sciences becomes relevant for the analysis.

Thus, in phenomenology the percept is a primary reality, *before* scientists try to explain the origin of sense perception and its information and meaning from a combination of interior physiological processes and exterior physical information disturbing the sense organs, or biology tries to explain the function of the sense organs and the nervous system from evolutionary and eco-physiological theories.

Phenomenologically, we must accept that biology cannot explain why and how we see and hear and smell the world (Edelmann 2000: 222). It can only model the physiological way the organs work, *but it has nothing to say about how they produce experience.* This is a choking fact for a neuro- and behavioural scientist studying the philosophy of science. But it is only a problem for those scientists who take philosophy of science seriously—and they are fairly few. Many empirical researchers do not see the problem and believe that more empirical research will solve any problem. And science concurs! I am arguing for a different, more philosophical, reflective view here.

In phenomenology, the knower, the known and knowing are viewed as one living whole in *the lifeworld*. The knowing consciousness contains the known objects (Drummon 2003: 65). Thus, phenomenology considers the lifeworld experiential

first-person awareness to be producing knowledge more foundational than that produced by the natural and social sciences.

The phenomenologist argument that knowledge starts in the non-dual lifeworld is one of the clearest arguments for the necessity of philosophy when determining how to evaluate and use the knowledge from the natural as well as the social sciences. It is especially Husserlian phenomenology upon which Merleau-Ponty draws, which figures the lifeworld as more fundamental than natural as well as social scientific knowledge and therefore claims that there is no scientific explanation for consciousness as it is the primary given. Consciousness in itself is not viewed as a product of the brain or of culture and language in Husserl (1997, 1999); only the content of consciousness and way of that content are expressed. But, on the other hand, Merleau-Ponty does not privilege the body over the mind—the body *is* the mind and vice versa, in that they are one whole synthesis. The phenomenological 'I' is a universal, natural, human sense-perceiving 'I' that brings things into existence for oneself through one's intentionality; this includes 'the other'. Merleau-Ponty writes (1962: xi):

> Perception is not a science of the world, it is not even an act, a deliberate taking up of a position; it is the background from which all acts stand out, and is presupposed by them.

It is through being in the world and experiencing the world that we have consciousness, but that world is not ontologically the same as the 'physical world' as it also includes the subjective and intersubjective world of living and communicating with other living, embodied conscious linguistic beings. Thus, the physicalistic and/or computational brain science, on the one hand, and phenomenology, on the other, operate in two different worlds that each sees the other as only describing a small part of reality that is not so important for the big picture. Both claim to be the most fundamental description of reality. They each have their map of the world on which the other almost does not exist or at least is not represented in a way they will themselves accept.

One of the deepest conundrums for the sciences is the undeniable fact of our own ability to undergo qualitatively varied sense experiences, such as internal drives and urges, as well as states of feelings and will that alter body processes. These lead to the ability to make our body carry out goal-directed movements which, in turn, fulfil goals, some of which can be bodily and psychological desires. Furthermore, this poses a very general problem for the sciences because this experiential aspect of reality is not just a matter of the special category of human consciousness—*all living beings have these abilities to varying degrees.* This is one of the reasons why biosemiotics is a necessary supplement to ordinary scientific biology as well as cultural semiotics.

One can try to avoid the problem, of course, by claiming that our experience of making conscious decisions on the basis of analysis of our qualitative experiences is an illusion or folk psychology (Churchland 2004a, b, and Dennett 1991, 2007) and that consciousness has no causal effect in the world as we know it. But I refuse to take eliminative materialism seriously, as I consider it to be a self-defeating paradigm, since by its elimination, it denies the fact that science has sense experience

and the ability to think and create and communicate meaningful theories, plus the ability to make purposeful experiments as a prerequisite. As Gadamer (1989) shows in his hermeneutics, science also has meaning and interpretation, based on a cultural historical horizon as a prerequisite, because it is dependent on the ability to create linguistic concepts and interpret them through one of many natural languages produced by cultures and their world views. That is very much the insight that Kuhn's paradigm theory (Kuhn 1970) builds on. Put simply, science is a cultural product.

7 Evolution and Teleonomy

I argue here that knowledge needs an experiential component added to the functional because sense experiences and awareness are usually not part of the biological story of the development of life and knowing. Thus, structural couplings in autopoiesis theory, affordances à la Gibson and Uexkull's tones are all important parts of a pragmatic evolutionary understanding of cognition, but it is not enough to make a theory of the emergence of the experiential mind in evolution.

Surviving entities in the course of evolution are those wherein the heritable structures of their DNA molecules contributed to solving survival problems. But how exactly this should happen as a mechanical process, we do not know. But the general idea is that starting from random noise, the autopoietic functions of the cell make it possible to selectively filtrate for useful functionality. As such, researchers often say that this process gradually builds knowledge of the world into the DNA sequence. But how, and what kind of knowledge?

Barbieri, in the further development of his code semiotics (2001), sees a parallel between the problem of the emergence of life from the physico-chemical world and the emergence of experience from the self-organization of living systems. To Barbieri, the production of new codes can solve both. Life is built out of new artificial molecular assembles by the DNA, RNA and ribosomal apparatus that combine amino acids in new, inventive ways. The solution to how the capacity to experience emerges from the brain of mammals is the production of new neural codes, which generate the brain's capacity for sense experience, emotions and imaginary abilities. Barbieri (2011) in his most interesting grand theory of code semiotics writes:

> The idea of a deep parallel between life and mind leads in this way to a parallel between proteins and feelings, and in particular to a parallel between the processes that generate them. We already know that the assembly of proteins does not take place spontaneously because no spontaneous process can produce an unlimited number of identical sequences of amino acids. The Code model of mind is the idea that the same is true in the case of feelings, i.e., that feelings are not the spontaneous result of lower level brain processes. They can be generated only by a neural apparatus that assembles them from components according to the rules of a code. According to the Code model, in short, feelings are brain-artifacts that are manufactured by a codemaker according to the rules of the neural code.
>
> In the case of feelings, the codemaker is the intermediate brain of an animal, the system that receives information from the sense organs and delivers orders to the motor organs. The

> sense organs provide all the information that an animal is ever going to have about the world, and represent therefore in an animal what the genotype is in a cell. In a similar way, the motor organs allow a body to act in the world, and have in an animal the role that the phenotype has in a cell. Finally, the intermediate brain is a processing and a manufacturing system, an apparatus that is in an animal what the ribotype is in a cell.
>
> The parallel between life and mind, in conclusion, involves three distinct parallels: one between proteins and feelings, one between genetic code and neural code, and one between cell and animal codemaking systems. The categories that we find in the cell, in other words, are also found in animals, because at both levels we have information, code and codemaker. The details are different, and yet there is the same logic at work, the same strategy of bringing absolute novelties into existence by organic coding.
>
> (Barbieri (2011: 380))

Thus, one can say that Barbieri offers a solution to Searle's problem of how biological processes allow the brain to produce qualitative consciousness. A later section in the article shows that Barbieri thinks of sense experience as modelling. It certainly is, but seen from my phenomenologically informed view, the problem is that it is a qualitatively unique kind of modelling. Barbieri (2011) writes:

> The results of brain processing are what we normally call feelings, sensations, emotions, perceptions, mental images and so on, but it is useful to have also a more general term that applies to all of them. Here we follow the convention that all products of brain processing can be referred to as brain *models*. The intermediate brain, in other words, uses the signals from the sense organs to generate distinct *models* of the world. A visual image, for example is a model of the information delivered by the retina, and a feeling of hunger is a model obtained by processing the signals sent by the sense detectors of the digestive apparatus.
>
> (Barbieri (2011: 388))

Barbieri uses the modelling idea from Lotman developed further by Sebeok and Danesi (2000). It is a good *functionalist approach* that catches some important practical aspects of reality. But when I make a model of the route I have to follow to get home from a new place in town, I actually visualize the streets. I see them and thereby experience them. I make the images for my 'inner eye' and draw on my lifetime's experiential memory of this town, in which I have lived my whole life. It is not just a logical map that directs my way home. It is embodied and experiential. I claim that it is qualitatively different from what such a map is to a robot, not least because I have the free will to choose not to follow it and to instead change the route. I am not in any way automatically determined to follow it. Clayton (2004: 601) also argues that the emergence into the quality of experience is different from other emergence theories. I agree though with Barbieri when he writes:

> The evolution from single cells to animals was a true macroevolution because it created absolute novelties such as feeling and instincts (the first modelling system). Later on, another major transition allowed some animals to evolve a second modeling system that gave them the ability to *interpret* the world. That macroevolution gave origin to a new type of semiosis that can be referred to as *interpretive* semiosis, or, with equivalent names, as *abductive* or *Peircean* semiosis.
>
> (Barbieri (2011: 391))

As many before him, Barbieri wants to use Peirce's triadic semiotic theory, but refuses his triadic metaphysics of firstness, secondness and thirdness—his synechism, hylozoism and tychism.[14] But this is the foundation of Peirce's general paradigm. Denying the ontological, epistemological and methodological foundation, he then tries to solve the problem that Peirce's pragmaticist triadism attempts to solve in the framework of what current scientific thinking is on the mammalian brain. From this foundation, he wants to explain the brain's production of mind through code-sign processes, introducing the triadic sign process including interpretation on this level as a result of the emergence of experience now explained from the code-semiotic paradigm. A semiotic system is here defined as a triadic set of processes and objects linked by a code. But this is not triadic in the Peircean sense, since the metaphysics does not entail his three categories as they emerge as indestructibles in the phaneroscopic analysis. Peirce combines phenomenology, mathematics and empirical data in his pragmaticism. Code semiotics is not able to integrate a phenomenological view in its paradigmatic foundation—neither ontological nor epistemological. To establish the genuine interpretative sign function, it has to be Peircean 'all the way down' to power the basic categories, which makes the sign triad function as a meaning-generating process (Ketner 2009). I challenge Barbieri to produce an alternative framework than can compete with Peirce's instead of introducing Peircean semiotics at the level of the brain on an implicit materialistic ontology wherein molecules assume agency and become code makers. The central question unexplained by Barbieri is how the macromolecules resume agency and make codes suddenly in an unspecified materialistic ontology.

Peircean biosemiotics suggest that what are transferred in and between living systems are signs, not objective information. Signs have to be interpreted, and it has to happen on 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 and territory seeking. Barbieri (2011) distinguishes between a cybernetic and instinctive aspect of the brain function and argues that the emotions emerge from the instinctual brain. I agree with this, but cannot see that he solves the problem Konrad Lorenz (who saw the same two aspects) could

[14] Peirce writes that tychism is '… absolute chance – pure tychism…' (CP 6.322, c. 1909). So tychism is connected to firstness as real objective chance in the universe. But it has to be integrated with the secondness of resistance, facts and individuality to create thirdness to mediate connections between the two in synechism. This is connected to his pragmatism: 'It is that synthesis of tychism and of pragmatism for which I long ago proposed the name, Synechism' (CP 4.584, 1906). Synechism is '…that tendency of philosophical thought which insists upon the idea of continuity as of prime importance in philosophy and, in particular, upon the necessity of hypotheses involving true continuity' (CP 6.169, 1902). This deep continuity between everything, including mind and matter as well as the three categories, is synechism:'…I chiefly insist upon continuity, or Thirdness,…and that Firstness, or chance, and Secondness, or Brute reaction, are other elements, without the independence of which Thirdness would not have anything upon which to operate' (CP 6.202, 1898).

not in his creation of the ethological paradigm (Brier 2008a, b, c, d). Based on these two aspects or levels, a new third level of meaning is created that the socio-communicative system can modulate to conscious linguistic meaning.

Today, it is widely recognized that what we call a human being is a conscious social being, living in language. Terrance Deacon, in his book *The Symbolic Species* (1997), sees our language-processing capacity as a major selective force for the human brain in the early stages of human evolution. We speak language, but we are also spoken by language. To a great extent, language carries our cultures as well as our theories of the world and of ourselves. As individuals, we are programmed with language—to learn a language is to learn a culture. As such, prelinguistic children are only potentially human beings, 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 to a biosemiotics is such an attempt for a doctrine of cognition and communication and therefore the creation of knowledge in the widest sense.

I do not see quantum physics, general relativity theory or non-equilibrium thermodynamics as being of any particular help concerning this problem, although they may be helpful in explaining the physical aspect of consciousness (Penrose 1994, 1997). This is my argument why a bottom-up, empirically based physicalism or pan-computationalism is inadequate to solve the gap problem. Here is where Peirce's theory of the tendency to take habits[15]—what he calls thirdness—brings the physical and the mental together in that he sees the tendency to take habits in both nature and mind. Here is one of those deep Peircean quotations arguing with the mechanical view of natural law:

> The law of habit exhibits a striking contrast to all physical laws in the character of its commands. A physical law is absolute. What it requires is an exact relation. Thus, a physical force introduces into a motion a component motion to be combined with the rest by the parallelogram of forces; but the component motion must actually take place exactly as required by the law of force. On the other hand, no exact conformity is required by the mental law. Nay, exact conformity would be in downright conflict with the law; since it would instantly crystallize thought and prevent all further formation of habit. The law of mind only makes a given feeling more likely to arise. It thus resembles the 'non-conservative' forces of physics, such as viscosity and the like, which are due to statistical uniformities in the chance encounters of trillions of molecules.
>
> (Peirce 1892)

This is why thirdness is so important in Peirce's categories and at the same time it is critical to remember that thirdness includes secondness and firstness.

The Cybersemiotic transdisciplinary theory accepts Peirce's view and sees scientific explanations as going from our present state of sociolinguistically based conscious semiosis in self-organized autopoietic systems towards a better understanding of the prerequisites of language and the self-conscious being. Science gives a good economically and practically useful understanding of certain

[15] As Peirce calls it.

processes, often in a way that allows prediction with a wanted precision within certain circumstances. However, it does not give universal explanations of the construction of reality, energy, information, life, meaning, mind and consciousness. Natural science deals only with the outer material aspect of the world and our body, not with experiential consciousness, qualia, meaning and human understanding in its embodiment (Edelmann 2000: 220–222).

Nicolescu (2002: 65–66)—who is also a quantum physicist—promotes, like Peirce does, the theory that consciousness is a vital and active part of the wholeness of the universe. The subjective and the objective sides of nature make up the whole of reality to an integrated whole based in what Nicolescu calls trans-nature or the zone of nonresistance. As such, he is close to Peirce's evolutionary concept of hylozoism.[16] We are the systems developed in and by the universe that are most highly developed to make the universe look at itself. As the universe in its fundamental quantum level is still partly undetermined, it is in an ongoing rearranging process of building itself (even all the way back to the Big Bang) (Rugh and Zinkernagel 2009). Nicolescu explains this further when he writes: 'Nature seems more like a book in the process of being written: the book of Nature is therefore not so much to be read as experienced, as if we are participating in the writing of it' (Nicolescu 2002: 65). That also seems to be Wheeler's (1994, 1998)(Davies 2004) view, as well as Peirce's. New foundational theories of agency and the quality necessary to be an observer have appeared (Sharov 2010; Arrabales et al. 2010). That problem cannot be solved here, but seems to be related to C.S. Peirce's idea of semiosis—the ability to make signs and interpret them meaningfully—as not only being limited to humans but including all living systems with a fuzzy border to the precursor systems of life, making thinking something that goes on in an ecological systemic context, as Bateson (1973) also views it (Brier 2008c).

8 Conclusion

Let us return to the Kant quotation on nature and free will and expand on it a bit further. Kant writes about the contradiction between free will and a lawful view of nature:

[16] In philosophy 'hyle' refers to matter or stuff; the material causes underlying change in Aristotelian philosophy. It is what remains the same in spite of the changes in form. In opposition to Democritus' atomic ontology, hyle in Aristotle's ontology is a plenum or a sort of field. Aristotle's world is an uncreated eternal cosmos, but Peirce used the term in an evolutionary philosophy of a world that has an end and a beginning. Hylozoism—in this context—is the philosophical conjecture that all material things possess life, very much like Whitehead's (1978) panexperientialism. It is not a form of animism either, as the latter tends to view life as taking the form of discrete spirits. Scientific hylozoism is a protest against a mechanical view of the world as dead, but, at the same time through synechism, upholds the idea of a unity of organic and inorganic nature and derives all actions of both types of matter from natural causes.

> It is an indispensable problem of speculative philosophy to show that its illusion respecting the contradiction rests on this, that we think of man in a different sense and relation when we call him free, and when we think of him as subject to the laws of nature…. It must therefore show that not only can both of these very well co-exist, but that both must be thought of *as necessary united* in the same subject.
>
> Kant (1909: 76)

I think this is what we have done in our work *towards a Wissenschaft of consciousness* that should be able to include mental events in an absolute naturalism.

But to make such a shift, one needs to develop an ontology that can encompass the ontologies of all the four views in a transdisciplinary setting. I have suggested to take our point of departure in C.S. Peirce's pragmatistic, evolutionary semiotic process philosophy, where semiotic social interactions between embodied more or less free minds in nature are viewed as the central process of knowledge production, which is also behind the self-same 'sciences' that attempt to explain the meaning of production and consciousness. Thus, we return to a partly Aristotelian view adding evolution plus phaneroscopy and biology in the form of a biosemiotics.

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