Cybersemiotics

A transdisciplinary and evolutionary framework encompassing information with meaningful cognition and communication through second order cybernetics and Peircean semiotics

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*Cybersemiotics: Why Information is not Enough*,

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2008. Also a Google book, further free papers on Brier’s home page.

A transdisciplinary philosophy and sociology of science study integrating information science with second order cybernetics and system science (Luhmann) and Peircean biosemiotics as well as embodied cognitive linguistics.
I have been at each point of the star, moved on to the next one and ended up in the middle.
Research question

How can we create a theoretical framework to understand the difference between computer’s information processing and animals perception, cognition and communication as well as the level of human subjective and social interpretation of meaning in language?

In short between the information processing of natural and technological system and the semiotic understanding of living systems?

This has relevance for many subject areas:
1. The human-computer interface challenge
2. Human embodied cultural intelligence versus AI and robotics
3. Document retrieval by meaning in automatic indexed systems
4. Information retrieval systems answering human meaningful questions
5. Machine translation of natural languages
6. The question of consciousness and brain relation: “the hard problem”
7. Data versus meaning
8. Physical perception versus signification
9. Science communication to common sense
Our attempts of understanding of the difference between

Three types of causality

1. **efficient** (physical energy based) causality (nature),

2. **formal** (informational & pattern matching) causality (computer and other technology),

3. **final** (semiotic and linguistic meaningful) causation with a goal (human consciousness, language and culture).

is transdisciplinary crossing boundaries between the natural, technical, social sciences and the humanities.
The Worldview of two cultures. Science and Technology exist in nature/the universe in which culture plays a minor role due to its late appearance in evolution. To Humanities and Social Sciences, culture is the primary reality in which we exist and nature is a culturally constructed concept changing with cultural evolution.
Norbert Wiener pointed out that

- Information is information, neither matter nor energy.

- Connects statistical information with thermodynamically entropy and information becomes negentropy (Schrödinger, Brillouin and Wiener) (Entropy in Shannon but no ontology)

- Information as negentropy becomes the organizing and sometimes creative aspect of nature.

- Ilya Prigogine developed this through his theory of dissipative structures. In developed forms of general system theory the organizing power of negentropy combined with the principle of emergence is used as explaining how life and consciousness arose from matter through self-organization as a theoretical explanation.
Bateson: Information and mind

- Gregory Bateson developed a non-technical and more wide-ranging concept of cybernetic information in a cognitive and an ecological direction.

- He defined information as “a difference that makes a difference” for a cybernetic mind.

- He attempted to link information, mind and meaning in a cybernetic and systems framework including the whole biosphere, as well as culture and social systems.
Cybernetic mind in Gregory Bateson’s *Steps to an Ecology of Mind*

1. The system shall operate with and upon differences.

2. The system shall consist of closed loops or networks of pathways along which differences and transforms of differences shall be transmitted. (What is transmitted on a neuron is not an impulse; it is news of a difference).

3. Many events within the system shall be energized by the responding part rather than by impact from the trig-gering part.

4. The system shall show self-correctiveness in the direction of homeostasis and/or in the direction of runaway. Self-correctiveness (negative feedback) implies trial and error.
Pan-computational philosophy.

- Bateson further develops the idea of the biosphere as the ultimate cybernetic mind and others widen the computational concept beyond the Turing computer and image the whole world as a computational system and most processes in nature, mind, culture and machine as being computational.

- We can call this a version of pan-informational philosophy. Energy, information and matter are the basic ontological building-blocs. Gregory Chaitin says that the world is a grand computer: pan-computation ontology.

- But where are the phenomenological dimension of experience, qualia, emotions and free will?
The **Mentalese** Model of the meaning of language

- Jerry Fodor is the most prominent scholar among those who argue that words are instruments by means of which we express ideas, which we have before they are verbally expressed.

- In other words, the “**language**” of thought is not the language in, which we express our thoughts, but something more fundamental and universal.

- Fodor postulates a universal **language of thought**, which he calls **Mentalese**, which differs from the language of public speech, by means of which it is expressed in an individual language, such as English, French, or Chinese.

- But if that is information and the brain is a computer, where does awareness, meaning and consciousness come from?
The information processing paradigm in the cognitive science research program.

1. Different information systems (humans, machines, animals and organizations) process information in the same way.

2. Conscious logical thinking is generally taken as a model for cognitive processes.

3. Understanding is viewed as categoric (set theoretically).

4. It is thought that cognitive processes can be broken down into parts of a process and, finally, can be seen as a viewed primarily as categorical and denotative. series of linear choices.

5. Perception is viewed as categorial in a classical set theoretical way.
6. Learning is viewed as happening according to formal logical rules and principles creating the structures of knowledge.

7. **Language** system is viewed primarily as a **formal mechanism** for the transferring of information by symbol manipulation between humans, machines and therefore between the human and the computer.

8. There is a clear tendency to view the **cognitive subject** as analogic with a computer and also to see the world as a computer and reality as a computational product: **IT from BIT**.

9. The emphasis on the **syntactic-structural aspect** in cognition and communication leads to a lacking of how the cultural-societal and historical contexts influence meaning.

10. The mechanism behind memory, the growth of meaning and the handling and understanding of symbols, is seen as a so-called ‘**semantic network**’ of mutually defined conceptions.
Heinz Von Foerster’s observer

- Realizes that he sees the universe from within.
- That he is made of the same “stuff” as his brain.
- That there has to be some – partly independent - energy and structure in the environment.
- There has to be other real observers to create reality and meaning.
- We are observing in communication together and computing a reality.
- The ontology produced even in second order cybernetics does not explain or even integrates subjective experience such as the phenomenological life world with the bits and differences
How is meaning possible in a computational world?

- Where does meaning come from, if not from a combination of neuronal computations in the brain and logical computation in the grammar of language?

- Does meaning arise through the cultural-linguistic categorization of brain states? Georg Lakoff seems close to believe the latter. But how?

- I will suggest that it comes from the signification of the feeling, intentional, qualia conscious body-mind of the living system developed through evolution.

- The contrast to a paninformational and pancomputational approach is a phenomenological pragmaticist semiotic view founded by C.S. Peirce. It is about the nature of the observer!
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- Semiotical view
- Informational view
The observer and second order cybernetics

“I have the theory of observing, I am myself an observer, so I am doing the observing,

I am including myself into the loop of argumentation. And in which way can I handle that?

... a serious attempt was made to cope with the epistemological and the methodological Grundlagen propositions that appear if you begin seriously to include the observer in the descriptions of his observations.

" (von Foerster, 1981, p. 104)

Experiential cybernetic biology is its own field: Autopoiesis! A description of living processes as self-organizing and self-creating organizational closed systems (Maturana).
AUTOPOIETIC EPISTEMOLOGY: No information transfer
A graphical model of the living system and its autopoietic interactions through its genome with itself, and its creation of a structural coupling with the environment that perturbates it in a repeatable way.
In Jacob von Uexküll’s cybernetic cognitive biology like in Bateson’s cybernetics perceptual objects are created interactively.

*Uexküll’s functional circle* that demonstrates his concept of objects in a cybernetic recursive process between receptors and effectors. Biosemiotics has interpreted Uexküll from a Peircean semiotics to be talking about signs!
Luhmann’s system theory generalize autopoiesis in a theory of communication

- He differentiates his theory from both the information processing paradigm and pan computational philosophy,

- In his system theory the embodied psychic system is the indispensable environment for this socio-communicative system to function.

- It is the vital environment for communicative systems.

- As such, his theory is not only meta-biological but also meta-psychological.
Luhmann’s meaning world

- There is a biological system in Luhmann’s system theory, but I am not sure that you can call it ‘a body’ or ‘the body’.
- Luhmann's revolutionary idea is to distinguish between biological, psychological and social autopoiesis.
- Autopoietic operational closure creates a 'meaning world' of its own that does not exclude outside influences, but selects them to have influence only according to the system’s own inner world of meaning and survival.
- The deep meanings of an individual's psychic world should therefore not be lost within the social, as we often see it in theories which seek to socialize the individual or deconstruct the subject through language-centered views like discourse theory and structuralism or a combination of both.
- The individual should re-emerge in Luhmann's theory as an autopoietic system of its own. But how?
LUHMANN’S TRIPLE AUTOPOIESIS

- Biological Autopoiesis
- Psychological Autopoiesis
- Inter-Penetration
- Individual Signification Sphere
- Socio-Communicative AutoPoietic Language Games

Interactions and Connections:
- Biological Autopoiesis connects to Psychological Autopoiesis.
- Psychological Autopoiesis connects to Socio-Communicative AutoPoietic Language Games.
- Inter-Penetration connects all three realms.
- Individual Signification Sphere influences all other spheres.
The psychic system

- Luhmann essentially identifies two autonomous worlds of meaning based on different autopoietic systems (psychic and socio-communicative) operations. They both operate in the medium of meaning.

- Thus psychic systems are silently thinking and feeling. But the social system communicates.

- Only communication communicates!

- This latter ability is not available to the psychic system! It only has its own closed world of meaning, thoughts and feelings.
Dynamics of meaning

- It seems safe to assume that the dynamics of meaning processing may be very different from the dynamics of information processing.

- Meaning often has an existential component and is connected to the life world of individuals, as well as organizations and the cultures as a whole where myth, religions and political ideologies contribute.

- While having specific meanings and communicating them can be considered as codifying information and different meanings can be based on different codifications because they are communicated in different symbolic generalized media, then ability to produce meaning in itself is not informational.

- As Luhmann also sees it, meaning is the field in which we make the significant differences, that make a difference (Bateson).
Mutual structural couplings are the basis for the ability of communication to establish interpenetration and actualizing a common reality. **What is information is negotiated.**
Social homunculi of modernity

- The participants in this process can be considered as 'social homunculi of modernity', in that they are artificial personae arising purely from social discourse.

- The contract can then be seen as being not between physical beings but between highly artificial structures, whose interactions form an autopoietic system of contract that has a logic and dynamic of its own.

- The interests that people think they are realizing or exchanging through a contract are therefore not their personal interests, but are social or discursive products.” (Teubner 18 June 1997)
Self-consistent constructivism

- "The task of constructivism ... is to describe a system's operation within its own domain of description and account for the constitution of its identity and the conditions of its continued persistence in its own terms.

- ... constructivists need to find a way of putting the knower into a known that is constructed so as to keep the knower viable in practice."

  - (Klaus Krippendorff 1991)

So where is the observer, consciousness and the subject?
The body’s brain as observer

- How did the body’s brain come to experience anything at all?

- Very few scientists think that a robot can experience anything at all.

- Experiential life itself is the basis for the observing and communication that makes scientific research possible. Second order observation.

- Perception is biologically, psychologically and social-culturally structurally coupled at the same time in order to make the observing system survive and procreate!

- A true transdisciplinary framework must include a reflective theory of the observer.
The phenomenological view

- This position considers itself as more fundamental than any social or natural scientific foundation; namely phenomenology.

- It is also the base of C.S. Peirce’s semiotics, but in a slightly different evolutionary semiotic formulation than the Europeans called phaneroscopy.

- Both Husserl, Heidegger, Merleau-Ponty and Peirce tells us that subjective consciousness is the self-generated core of our life-worlds, which are before anything that wissenshaft can define. It is general where the sciences are special.
“Science has not and never will have, by its nature, the same significance qua form of being as the world which we perceive, for the simple reason that it is a rationale or explanation of that world. I am, not a ‘living creature’ nor even a ‘man’, nor again even ‘a consciousness’ endowed with all the characteristics which zoology, social anatomy or inductive psychology recognize in these various products of the natural or historical process – I am the absolute source, my existence does not stem from my antecedents, from my physical and social environment; instead it moves out towards them and sustains them, for I alone bring into being for myself ...the tradition which I elect to carry on,“

(Merleau-Ponty. The phenomenology of perception (1966) p. ix)
Physiology

Phenomenology and hermeneutics

Behavioral analysis

Social sciences

Human

Pragmatic semiotics and language philosophy

The information science

Based cognitive science
The Cybersemiotic Star

What is the connection?
The view from the middle!


- The grand materialistic-informational narrative takes us from view 1 to 4 in one story using the problematic concept of emergence to describe the qualitative jumps between the four.

- If we leave this logical positivistic unity of science approach and accept the qualitatively differences between the approaches instead and accept to encompass them all four at the same time developing knowledge from the middle of the intersubjective embodied communicative and empirical discursive knowledge of living conscious systems.
A sign is what an object presupposes!

- Peircean semiotics develops a general theory of all possible kinds of signs, their modes of signification and information, and whole behavior and properties.

- Semiotics is the study of semiosis and is an inquiry into the conditions, which are necessary in order for representations of objects to function as meaningful signs. A system need to be living in order to produce intentional signs. A biosemiotics is developed. Thomas Sebeok, Jesper Hoffmeyer, Claus Emmeche, Kalevi Kull, John Deely, Frederik Stjernfelt, Anton Markos.

- Differences that makes a difference becomes part of semiosis. They are seen as signs! If not they are not seen at all.

- Semiotics is the theory of the conditions, which determine the truth of signs. Logic presupposes semiotics!
1. Representamen (the sign vehicle)

2. Object (a relevant aspect of reality)

3. Interpretant (embodied social practical understanding)

Peirce’s semiosis
Peirce’s Three Ultimate Categories

- All networks can be broken down to triads, but real triads do not consist of dyads. These categories are more fundamental than Kant’s, Hegel’s and Aristotle’s. Not at least because they are phenomenological.

- **Firstness** is a continuum of random spontaneity, potentiality, feeling, (mathematical) forms and qualia with a tendency to take habits. In semiosis Representamen is Firstness.

- **Secondness** includes manifestations of resistance, force, will power, dualistic concreteness and impenetrability of objects. In semiosis the object is Secondness.

- **Thirdness** includes all kinds of regularities, such as habits of nature and understanding mediating between Firstness and secondness. Only here can true triadic sign processes happen (semiosis) meaning the creation of interpretants. In semiosis the Interpretant is Thirdness. Would-bes.
Peirce’s semiotics as epistemology

1. Peirce’s theory of signs can be seen as a theory of perception, reasoning, cognition and communication, asserting that all modes of thinking depend on the use of signs.

2. Every thought is a sign. No direct introspection!

3. Every act of reasoning consists of the interpretation of signs.

4. Semiosis is a process of cooperation between signs, their objects, and their ‘interpretants’.

5. Semiosis, both in form of signification and communication, is an important part of what makes living systems transcend pure physical, chemical and even informational explanations.
The life of signs in the living

1. Signs, in the process of semiosis, are semiotic agents with a certain developmental autonomy of their own.

2. A sign is always useful for the system. Its value can be determined by its contribution to the reproductive and procreative value and pleasure of the entire system.

3. Semiosis is a crucial part of those processes that make systems living and lift them out of the physical world of efficient causality through the informational realm of formal causality in chemistry into the final causation in semiotic processes.
Logic of semiosis

- Semiotics is the study of semiosis and is an inquiry into the conditions, which are necessary in order for representations of objects to function as signs.

- Logic as semiotic is the theory of the conditions, which determine the truth of signs.

- It is a normative science, in that it is a theory of the kind of reasoning, which should be employed in order to discover truth.
The codes of sign systems

- Semiotics is also defined as the study – or doctrine - of signs and sign systems, where sign systems are most often understood as constituting codes.

- Language of cause depends on social and cultural codes. Example of biological codes are the codes for the reception and the effects of hormones and neurotransmitters on various tissues, which are obvious biological sign systems.
Signification is based on a previous level of signals and codes: the informational

1. Biological molecules are coded, and interact through formal causality.
2. Cells interpret the coded molecules as signs through final causation. Cells are the fundamental biosemiotic subjects.
3. Bateson was on the track of semiotics: A cybersemiotic interpretation of him would say: a difference has to make a difference (to someone) to become a sign.
Five-leveled metaphysics

1. A primary chaotic level of continuity, quality and potentiality with a tendency to take habits (Firstness).

2. A level of matter, energy and causality by natural forces (Secondness).

3. An informational, cybernetic system level of quasi-semiotic signals, which encompasses the goal-oriented informational systems described by first order classical cybernetics as coded signals of differences.

4. The semiotic level belonging to all living systems (biosemiotics), which are so far the only systems level capable of true triadic semiosis. Sign making is immanent in nature, but only manifest in full triadic semiosis in the living systems.

5. The level of conscious language using systems (language games, arguments) is, to our present knowledge, only owned by humans.