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Finding an information concept suited for a universal theory of information☆

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ABSTRACT

The view argued in this article is that if we want to define a universal concept of information covering subjective experiential and meaningful cognition - as well as intersubjective meaningful communication in nature, technology, society and life worlds - then the main problem is to decide, which epistemological, ontological and philosophy of science framework the concept of information should be based on and integrated in. All the ontological attempts to create objective concepts of information result in concepts that cannot encompass meaning and experience of embodied living and social systems. There is no conclusive evidence that the core of reality across nature, culture, life and mind is purely either mathematical, logical or of a computational nature. Therefore the core of the information concept should not only be based only on pure logical or mathematical rationality. We need to include interpretation, signification and meaning construction in our transdisciplinary framework for information as a basic aspect of reality alongside the physical, chemical and molecular biological. Dretske defines information as the content of new, true, meaningful, and understandable knowledge. According to this widely held definition information in a transdisciplinary theory cannot be 'objective', but has to be relativized in relation to the receiver's knowledge, as also proposed by Floridi. It is difficult to produce a quantitative statement independently of a qualitative analysis based on some sort of relation to the human condition as a semiotic animal. I therefore alternatively suggest to build information theories based on semiotics from the basic relations of embodied living systems meaningful cognition and communication. I agree with Peircean biosemiotics that all information must be part of real relational sign-processes manifesting as tokens.

1. Where to start the development of an information concept?

The view argued in the present paper is that if we want to define a universal concept of information covering subjective experiential and meaningful cognition - as well as intersubjective meaningful communication in nature, technology, society and life worlds - then the main problem is to decide, which epistemological and ontological framework a transdisciplinary concept of information should be based on. One of the main deep problems in defining a universal information concept is, that all the ontological attempts to create objective concepts of information such as Claude Shannon's (Shannon and Weaver, 1963/1948), Norbert Wiener's (Wiener, 1965/1948) cybernetics and John Archibald Wheeler's "it from bit" (Wheeler, 1994) results in concepts that cannot encompass meaning and experience of embodied living and social systems. But even Carnap realizes that the basic condition of all empirical science was the individual as well as cultural experience of researchers and that the psycho-physical problem is unsolved (Carnap, 1967:32–39).

Shannon (Shannon and Weaver, 1963/1948) and especially Wiener's (Wiener, 1965/1948) types of mathematical definitions of information related to mathematical or physical concepts of neg-entropy cannot adequately encompass the experiential embodied pragmatic semantic meaningful content of ordinary sign games of living systems and the language games of embodied conscious humans. I have in Brier (1996a, 1996b and 2008) criticized the information-processing paradigm and second-order cybernetics, including Niklas Luhmann's communication theory (Luhmann, 1995), for not being able to produce a

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foundational theory of signification and meaning as they lack a phenomenological first person view. It was not Shannon's intension, but his work has been used that way. I do not find convincing evidence that the core of reality across nature, culture, life and mind can be proven to be of a purely mathematical, logical or computational nature. It was never Shannon's intension of going further than the statistical-probabilistic technical aspect of human communication and he underlined that there was no concept of meaning connected to his theory. It is the work of Wiener and Schrödinger that makes the connection between the mathematical and the physical concepts of communication. Never the less there has not been much attention on the difference in Shannon and Wiener's definition of information as entropy and as neg-entropy. But it is the last definition that paves way at the transdisciplinary idea of information. The first move in this direction can be seen in Brillouin 1962 (first version 1956). Wiener (1965) pointed out that Information is information, neither matter nor energy! His theory of cybernetics connects statistical information with thermodynamically entropy and information thereby becomes negentropy (also used by Schrödinger (1944/2012)). Information as negentropy in the self-organizing systemic complexity paradigm becomes the organizing and sometimes creative aspect of nature. Prigogine (1980, 1996 and Prigogine and Stengers, 1984) developed this idea of self-organization through his theory of dissipative structures. In developed forms of general system theory the organizing power of neg-entropy is combined with the principle of emergence and is used as explaining how life and consciousness arose from matter through self-organization as a theoretical explanation how matter became alive through emergence. Bateson (1972, 1979) developed a non-technical and more wide-ranging concept of cybernetic information in a cognitive and an ecological direction based on Wiener's cybernetic view of information as negentropy. He defined information as “a difference that makes a difference” for a cybernetic mind. He attempted to link information and meaning in an ecological cybernetic mind. Here are the basic criteria for the cybernetic informational 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 triggering part.4. The system shall show selfcorrectiveness in the form of negative feedback in the direction of homeostasis and/or in the direction of runaway. Self-correctiveness (negative feedback) implies trial and error.

The strength in Bateson's work was that he developed a non-technical and attempted to link information and meaning in an ecological cybernetic mind-framework including the whole biosphere, as well as culture and social systems. Through a functionalistic concept of cybernetic mind, Bateson further develops the idea of the biosphere as the ultimate cybernetic mind and thus finding “the pattern that connects”. This view was later supported by James Lovelock's (Lovelock, 1972, 2000, 2009) vision of the whole biosphere as one self-regulation system, which he called Gaia after the classical Greek god for Earth and the great mother of all. But in this ultimate cybernetic vision of self-regulating systems, there is no theory of the role of experiential mind. Thus I do not find any of the approaches building on objective pan-computational or/and Pan-informational metaphysics or paradigms are able to explain and model human meaningful social communication and information exchange in nature and machines at the same time.

The dominating transdisciplinary theory of signification and communication in nature, humans, machines, and animals, is the information-processing paradigm of cognitive science (Gardner, 1985) used in computer informatics and psychology (Lindsay and Norman, 1977; Fodor, 2000) and in library and information science (Vickery and Vickery, 1987). It is also found integrated with system theory and cybernetics as well as a general renewal of the materialistic evolutionary worldview (e.g., Stonier, 1997) and as a pan-informational and pan-computational paradigm for al processes in nature, culture, society and technology (Se papers in Dodig-Crnkovic and Burgin (2010) and Davies et al. (2009)).

As Thomas Nagel (2012) I see no way of developing a theory, which can lead to a explanatory model encompassing the living, experiencing body and its consciousness' integration with communicational networks such as natural and artificial languages in humans (Brier, 2010) if we start in mathematics and physics in the form of the present idea of objective conception of information bits and thermodynamically defined energy. Therefore I find it unavoidable that we must start in a way that includes the “experiential life world” of Husserl and Merleau-Ponty.

The core of the information concept should not only be based on pure logical or mathematical theory and rationality concepts like game theory or probability theory or the Turing computation concept and various ways to define bits. Even Bateson's (1972 and 1979) definition of information as a difference that makes a difference for at cybernetic mind lacks a basic theory of experiential consciousness and emotions or what the phenomenologists call the “life world”. Thus I find C.S. Peirce (CP, EP, W)[1] attempts to broadening the view by working towards showing that *logic is semiotic* – meaning that formal logic is only one aspect of logic - very promising.

Thus logic and rationality is an aspect of the pragmatic semiotics of cognition and communication of all living being. I therefore find it necessary to add biosemiotics to transdisciplinarity if we want to encompass living nature as well as the machine and the human experiential mind a transdisciplinary theory of signification, cognition, and communication. Thus we need to be able to include perception, signification and meaning construction from the start on as a basic aspect of reality alongside the physical, biological and social. Semantics becomes important.

But a semantic probability information theory like Bar-Hillel and Carnap's (1953) and Bar-Hillel (1964) is not enough, because it imagines a formal language consisting of all sentences that might be true in a given possible universe (cf. Bar-Hillel, 1964: 224) as the basis for its probability models. This is problematic since Chomsky has pointed out that all natural languages have the intrinsic capacity to generate an infinite number of well-formed sentences and, that no natural language has a finite determinable number of sentences that could serve as a basis for determining all true sentences or any reliable kind of probability models.

Thus information in the theory I want to develop is not ‘objective’, but relativized in relation to the sender's as well as the receiver's knowledge. This makes it difficult to operationalize the idea of probability in reality if not on some kind of Bayesian foundation. This makes it difficult to produce a quantitative statement that is more reliable than a qualitative analysis based on some sort of relation to the human condition. We seem to have to combine both.

[1] I uphold the tradition of referring to Peirce's work with the abbreviation: **CP** for collected paper (see Peirce (1931–58). *Collected papers*. **EP** for *Essential Peirce* (see Houser and Kloesel (1992). *The Essential Peirce. Selected Philosophical Writings, Volume 1* (1867–1893) and Peirce Edition Project (1998). *The Essential Peirce. Selected, Philosophical Writings, Volume 2* (1893–1913)), **W** for Writings (see Peirce Edition Project (1982-2009) *Writings of Charles S. Peirce: A Chronological Edition* 1857–1892 Volume 1–8.