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# **Informationswissenschaft zwischen virtueller Infrastruktur und materiellen Lebenswelten**

**Information Science between  
Virtual Infrastructure and Material Lifeworlds**

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## Meaningful Information, Meaningful Lives: Principles of a Semantic Information Science

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### **Abstract**

In the 1990s, cultural theorists who speculated about the implications of the Internet for society, education, interpersonal interaction and academic research tended to base their thinking on the assumptions of semiotics, or, in its most radical form, deconstruction. There was an emphasis on hypertext and hypermedia. The driving forces of that initial decade of the Internet have left us with a Semiotic Information Science: the study, design and implementation of communicating processes and relations – in a word, links – among nodes of information. In libraries and businesses, archives and museums, we catalog, index, manipulate, store and retrieve information. The paradigm shift to a Semantic Web and a Semantic Information Science offers the strong hope that we can move towards a science and society of qualitatively greater knowledge and intelligence. I advocate an expansion of the meaning of Semantic Web from a set of standard data formats for including ‘semantic’ content in web pages to semantics understood as the branches of linguistics, computer science and psychology that deal with meaning. A Semantic Information Science will focus on the contexts that give meaning to words (as in linguistic lexical semantics), emphasize the ineffable and experiential qualities of ‘nodes of information’ (as in psychological semantics), and deepen the meanings and interpretations of programming expressions (as in my proposed extension of computer science semantics). Semantic software (see the SBSGRID platform) will provide natural language access to data-

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bases, return answers to associative questions, bring together the flexibility of search with the precision of query, and contextually fathom the user's needs. The more meaningful information of the Semantic Web and a Semantic Information Science will help us to "work, play, learn and care for our health differently" (ibid.) and give us more meaningful lives.

## 1 Semiotics

In the 1990s, cultural theorists who speculated about the implications of the Internet for society, education, interpersonal interaction and academic research tended to base their thinking on the assumptions of semiotics, or, in its most radical form, deconstruction. The semiotics that most influenced cultural and media studies in Western universities was that in the tradition of the Swiss linguist Ferdinand de Saussure (*Cours de linguistique générale* 1916), who initiated "the study of signs and sign processes (semiosis)" (see the English-language Wikipedia article on semiotics). This post-Saussurian semiotics is related to linguistics, yet it also studies non-linguistic sign systems and is a prevalent methodology within cultural anthropology, media sociology, and the study of information systems like the Internet. The French philosopher Jacques Derrida (the founder of 'deconstruction') radicalized Saussure's semiotics when he said that there are endless chains of signification in sign systems, and not just a one-to-one static relationship between the signifier (sound) and the signified (concept) comprising words which, in turn, comprise the relational and arbitrary system of language.

In an interesting excursus on the early Derrida's concept of *différance* (a philosophical neologism meaning both difference and postponement), Canadian cultural theorist Gary Genosko (former general editor of *The Semiotic Review of Books*) isolates the disparity between Derrida's and Jean Baudrillard's anti-semiologies or respective critiques of Saussure as located in a decisive difference in emphasis placed on the 'orders' of either value or signification (Genosko 1994: 18–24). In his examination of the Saussurian sign (primarily in *Of Grammatology*, but also in *Speech and Phenomena*, and in the essay "Différance"), Derrida focused on the negative "linguistic concept of difference without positive terms," taking apart Saussure's mistaken dualistic metaphysics of signifier and signified, thus leading to critical recogni-

tion of the impossibility of the sign's self-referential unity or full presence to itself (Derrida 1985, 1989, 1997; Daylight 2012). The self-presence of Saussure's sign is comparable to the self-presence of speech (as opposed to writing) as privileged by Plato at the dawn of Western metaphysics. The doubled, horizontal relationship of value in Saussure, which relies for its structuration on the sign's two internal components (signifier and signified) and the 'bar' between them, is shown by Derrida to be a myth (of the 'transcendental signifier' that is universally true across cultures and is its own origin). By consequence (according to me), the vertical relationship of signification – essentially a cultural-and-media systems operation which is the bar between the sign as a unified holistic entity and what the sign excludes – must also be mythical (Genosko and Baudrillard emphasize this, but Derrida ignores it). This is why I always thought that Baudrillard was a more important thinker than Derrida, even though the opposite view was the established one. Baudrillard engaged directly with contemporary cultural-and-media systems, whereas Derrida merely 'politicized philosophy'. Baudrillard studied consumer objects, cars, advertising, shopping malls, and Disneyland (Shapiro 2010).

Cultural and media signification, which depends for its functioning on the 'institution' of a positive plenitude of the sign, is prematurely subsumed under value (by the prevailing 'deconstructionist' academic ideology of the 1980s-1990s), which has already undergone the negative Derridean critique of the "subversive, differential play of language". The edifice of signification (Baudrillard's 'vertical' critique of Saussure's sign) is subordinated to the foundation of value (in Derrida's 'horizontal' critique of Saussure's sign). Once the foundation fails, the building is – much too quickly – believed by deconstruction to collapse along with it. The rapid stress applied by Derrida to the bar of value both denies to signification the preconditions for its effective scrutiny, and underestimates the intractability of the self-aware, self-managing continually morphing positive sign for which codes are decisive and 'the model precedes the real'. The negative deconstructionist critique of the transcendental signifiers misses out on the crucial trans-disciplinary cultural theory and praxis of simulations and simulacra.

The early emphasis in Baudrillard was on the stability of the sign in its positive configuration, the ruling semiocracy, or the collective, auto-erotic 'passion for the code' which institutes a serialized social 'cohesiveness', and is opposed en bloc to the suppressed anthropological principle of symbolic exchange, or later, to the superficial and reversible play of appearances

which is seduction. Baudrillard: “To become an object of consumption, an object must first become a sign (...) it is thus arbitrary (...) it derives its consistency, and hence its meaning, from an abstract and systematic relationship to all other sign-objects” (Baudrillard 1996: 166). In the vertical order of signification of the (not yet distributed) system of objects, difference is still organized on the level of undivided signs, in the bar of separation between the coded abstraction of the joined signifier/signified and that which this ‘ideological unity’ radically exiles (Georges Bataille’s sumptuary expenditure and Marcel Mauss’ potlatch and obligatory gift exchanges) (Bataille 1988; Mauss 1954; Hyde 1983).

## **2 Recognizing the triadic structure of the sign**

In the 1990s, there was an emphasis on hypertext and hypermedia: the advancement of certain myths of the democratization of knowledge and the undermining of the authority of the author. The ‘hegemonic’ texts of the time were written by ‘critical theory’ and ‘media design’ American professors like George P. Landow of Brown University (*Hypertext: The Convergence of Contemporary Critical Theory and Technology*) and Jay David Bolter of the Georgia Institute of Technology (*Writing Space: The Computer, Hypertext, and the History of Writing*) (Landow 1991; Bolter 1990). Distributed systems like the World Wide Web and markup languages like HTML that figured prominently in the invention of the software layer of the Internet were a parallel development to the cyberspace theories within the semiotic paradigm. The driving forces of that initial decade of the Internet have left us with an essentially Semiotic Information Science: the study, design and implementation of communicating processes and relations – in a word, links – among nodes of information. In libraries and businesses, archives and museums, we catalog, index, manipulate, store and retrieve information – understood as little itemized signs or signals fed into or output from our glorious institutional systems of classification and collection.

The more these signs circulate in our networks and are massively available in thin horizontal abundance, the further we sink into semiotic meaninglessness. Everything is connected but loses its depth and singularity. We are surrounded by mountains of information garbage (for example: tens of millions of web pages automatically generated by computer programs which say

nothing more than – repeated twenty times – “this is a page about the subject of X”). We retrieve more and know less. We talk more and say less.

Sometimes you have to rap, and sometimes you have to go into the time-honored academic-online mode of the rant: I believe that a Peircian semiotic could be implemented on the Internet (or a successor to the Internet), and that this a very worthwhile goal. A Peircian emphasis on content, meaning, and deep referent as counterpoint to what is currently happening on the Internet, which is the nightmare realization of the fundamental media-theory-insight of Marshall McLuhan-Jean Baudrillard that “the medium is the message” gone haywire.

Content means nothing right now. Everything is links, links, links, where can I get my website or blog linked or ping-backed to as many other websites as possible. And this is happening in the context of the rampant reign of Homo Economicus. More links to my website equals more visitors equals higher google ranking equals the dream of the pot of gold.

Any chat of any kind today immediately deteriorates into: “Are you on Facebook?”; “Are you registered at the Huffington Post?”; “Do you have Skype?, MSN?, Yahoo Messenger?, etc.”; “Meet me at odesk.com or elance.com and let’s get exploited together”; “That’s a nice app you’ve got, but does it run on iPad?”; “Nice book there, but it is on Kindle?”. The media that overwhelms the message was TV for McLuhan-Baudrillard. Today that fetishized media is Facebook, Twitter, Skype, MSN, Kindle, etc. And add to that list the fetish of “just the facts, ma’am” of the Wikipedia gatekeepers.

There is little interest in human communication itself, and it matters little what you actually have to say: what counts is that you say it in the right, cool, hip, awesome media. Of course, this is only one side of the story. The reverse is also true: Facebook, Twitter, and Wikipedia are truly awesome.

Charles Sanders Peirce was the founder of semiotics, and he is the best semiotician – better than Umberto Eco or Jacques Derrida or Jean Baudrillard or Alain Greimas or Roman Jakobson – because his viewpoint includes everything about the chains of signs and signifiers that is in their systems, but Peirce also emphasizes meaning, the referent of the sign. The hypertext cultural theory crowd of the 1990s of Landow, Bolter, Brown University Semiotics Department, etc., didn’t really get Peirce. A Derrida-only-inspired view of hypertext is exposed to a kind of nihilism of the chain of signifiers. On the contrary, the triadic structure of the sign in Peirce’s semiotics is directly relevant to my main scientific research project of ‘the software of the future’ (Shapiro 2013).

### **3 Consequences for computer science**

Market analysts and IT experts still report that only about 20 percent of all software development projects reach a successful conclusion. The remaining 80 percent of projects overrun their budgets, go on longer than expected, do not implement all the desired functional requirements, or are prematurely terminated out of frustration. How can software more effectively be made? One possible answer has been suggested by software developers in the ‘Object Spaces’ community. According to Wikipedia, Object Spaces is a paradigm for distributed computing and ‘global’ (system-wide) object coordination. My view is that Object Spaces is the start of the right road towards making a qualitative revolution in Computer Science: a major upgrade in how software is made, and in the power of what it can do. Improving the overall situation of software development will be made possible through adapting an Object Spaces approach which can be described as holistic, since it takes on infrastructural challenges with an application-centered unified programming paradigm.

Any interaction in an Object Space software system has a triadic structure which has a strong affinity with the core concept of the original semiotics of Charles Sanders Peirce. Peirce was a nineteenth-century ‘American pragmatist’ who is indisputably the most important figure in the history of semiotics. Peirce’s idea of the triadic sign relation occasioned the definition of semiosis as an “action or influence, which is, or involves, a cooperation of three subjects, such as a sign, its object, and its interpretant, this tri-relative influence not being in any way resolvable into actions between pairs” (Peirce 1998: 411). The representations of an object operate as a sign, and meaning emerges from the triadic relation among sign, object, and interpretant. Every human thought is a sign, the mediation between an object and an idea. Reasoning or cognition is the interpretation of signs.

The triadic relationship – as opposed to any diadic relationship between a sign and an object, or an object and an interpretant – is the breakthrough to a new paradigm in Computer Science. A 19th-century seminal idea is already two centuries ahead of the 17th-century ideas of René Descartes and Francis Bacon on which existing Computer Science is based. Meaning emanates and flows from the ‘thirdness’ of a genuine triadic relationship. There is also an echo here of something from the psychoanalysis of Jacques Lacan: the third participant provides a mirror illuminating the reality of the relationship be-

tween the first and the second peers. Concepts from the humanities lead to a qualitative upgrade in Computer Science.

Object-oriented software engineering and multimedia design (in their prevalent forms) are languages for the substitution (Paul Virilio), streamlining, administration, and control of human experience. But the paradigm shift to a Semantic Web and a Semantic Information Science offers the strong hope that we can move towards a science and society of qualitatively greater knowledge and intelligence.

From Peirce's triadic semiotics we can move on to semantics. John F. Sowa, Professor of Philosophy and Computers and Cognitive Science at the State University of New York at Binghamton makes this connection, as does Hans Kamp in his 'discourse representation theory', and do Jon Barwise and John Perry in their elaboration of 'situation semantics' (Sowa 1995; Kamp 1981; Barwise/Perry 1983). The bridge from Peirce to semantics is built on focus on situations, contexts, and environments.

Toby of Pierce Communications, Belfast, Northern Ireland writes: "Semantic code is code that displays meaning through the markup of a webpage or use of attributes and variables within blocks of code. In the case of HTML it means that you can understand what each element on a page does without the use of CSS classes or stylings" (Toby 2012). Semantics is important also for writing good JavaScript code that is self-documenting with clear names for variables and functions.

Of course, I am advocating an expansion of the meaning of Semantic Web from a set of standard data formats for including 'semantic' content in web pages to semantics understood as the branches of linguistics, Computer Science and psychology that deal with meaning. I am especially interested in lexical semantics within linguistics, which is the study of how and what the words of a language denote. There are many other semantic subfields within linguistics, and there is also a semantics within semiotics, but those are different significations of the word semantics.

One could say that Tim Berners-Lee, the inventor of the World Wide Web and the director of the World Wide Web Consortium (W3C), has himself shifted from a semiotic to a semantic approach to structuring the Internet, albeit much more via a technical than a cultural perspective. The W3C oversees the development of proposed Semantic Web standards. Berners-Lee defines the Semantic Web as "a web of data that can be processed directly and indirectly by machines". In 2006, he stated that the project of the Seman-



tic Web “remains largely unrealised” (Shadbolt/Hall/Berners-Lee 2006, see the English-language Wikipedia article on the Semantic Web).

## 4 Semantic Information Science

A Semantic Information Science will focus on the contexts that give meaning to words (as in linguistic lexical semantics), emphasize the ineffable and experiential qualities of ‘nodes of information’ (as in ‘episodic memory’ within psychological semantics), and deepen the meanings and interpretations of programming expressions (as in my proposed extension of Computer Science semantics). John F. Sowa references one aspect of the very rich and influential work of computer scientist John McCarthy (who coined the term ‘Artificial Intelligence’ and invented the Lisp programming language), who introduced context into natural language processing, and also “as a basis for organizing and partitioning knowledge databases” (Sowa 1995; McCarthy 1990). Sowa goes on to say that there is confusion in this field regarding what should be called a context: “Some people apply the word to the package (the mechanism for grouping information as a single unit); and others to the information contained in the package, to the thing that the information is about, or to the possible uses of either the information or the thing” (Sowa 1995). This is an issue that needs to be clarified as part of the process of establishing the basic principles of a Semantic Information Science.

According to Wikipedia, linguistic lexical semantics is “the study of how and what the words of a language denote (...) The units of meaning in lexical semantics are lexical units”. Notice the redundancy and tautology (i.e., meaninglessness) of this last phrase. It is about as insightful and adding to knowledge as saying “a blue sky is a sky that is blue”. In good writing, you don’t use the same word twice in such close proximity (in this case, ‘units’). Yet the phrase stands proud as a valid Wikipedia sentence because ‘lexical units’ is a highlighted hyperlinked word pair. Clearly the sentence was written for the sole purpose of getting that hyperlink to another Wikipedia article into this Wikipedia article. The emptiness of the word hijacked by the link.

Psychological semantics distinguishes between “semantic memory” (the general meaning of remembered events, and the possession of factual knowledge separate from the context in which it was acquired) and ‘episodic mem-

ory' (the details of remembered experiences and the emotions associated with them). My view is that our orientation towards 'semantic memory' results in our intellectual knowledge becoming a 'split off' part of ourselves. We are detached from human connection to what we say. In the "Star Trek: The Next Generation" episode "The Measure of a Man," the android Data objects to the proposed plan of Commander Bruce Maddox to dismantle him in order to discover how the Artificial Intelligence 'positronic brain' really works. Data is convinced that the micro-engineering procedure is too risky, and will likely result in extermination of the life and personality that he has attained through his years of experiences. Data believes that, independent of whether or not the investigative test proves successful, the ineffable qualities of his memories will be lost during their temporary transfer onto an ordinary computer storage medium. Dr. Maddox will have to download Data's core memory to a standard format prior to the android's disassembly, and then re-upload it into his positronic brain after reassembly. His recollections will be "reduced to mere sterile facts of the events (...) The substance, the flavor of the moment could be lost," Data contends.

To deepen the meanings of programming expressions in Computer Science semantics, every object-oriented class should have a polymorphic experimental version of every operation corresponding (according to a naming convention) to the existing 'engineering' version of that operation which, in the current paradigm, returns a definite computational result-answer to an instruction. In a field of knowledge that is a science as well as an engineering practice, every act should be an experiment – or at least there should be an experimental variant of every act – in this case testing the possibilities of the logic gate, which must henceforth also be considered as a quantum gate. Computer engineering imposed a simulated-hyperreal-world system of definite answers upon the world of quantum possibilities in order to get something functional 'up and running'. We know from quantum physics that there are many more states than the discrete identities-differences of computer engineering. The subtle similarities among the states are so vast because it is a world of potentialities which have not yet been 'actualized' in the jump-over to 'real-world' decisional states. One of the main components of the working quantum computer in software that I propose is the 'Quantum Reservoir' of non-observable information. The 'Quantum Reservoir' must be protected by a wall of invisibility or non-graspability. Beyond that wall is information that we cannot directly access, the values of which we cannot explicitly set or get.

Semantic software (see the SBSGRID or SBSVALID platform: <http://www.sbsgrid.net/>) will provide free form natural language access to databases, return answers to associative questions, bring together the flexibility of search with the precision of query (multi-level database joins), and contextually fathom the user's needs. When working with semi- or unstructured data (including websites, blogs, videos, PDFs, word documents and tweets), SBSGRID uses Semantic Crawlers to leverage the power of Linked Data. 'Associative Information in Context' and SearchQueries (contextual reasoning) let the user or software agent see new relationships among data. SBSGRID dynamically cross-references database tables and brings together different databases into a 'dynamic information network'. Its self-evolving machine learning engine identifies categories, styles, operators, synonyms, and the overall context of the complex multi-level natural language query. "The user gets new insights and sees new relationships, facts and circumstances which had been practically inaccessible before" (adapted with permission from material at the SBSGRID website).

The more meaningful information of the Semantic Web and a Semantic Information Science will help us to "work, play, learn and care for our health differently" (ibid.) and give us more meaningful lives. We live in an oligopolistic capitalist society where very few people have the opportunity to exercise their creativity. Most people have to sell their time in exchange for money in order to survive. Work tends to be alienated, and most forms of play border on addiction. Education and health care are organized like industrial processes. Technology and automation have the potential to liberate human experience in all of these spheres, but so far this has happened only in partial ways under the current regime of how technology and automation are designed and implemented. Yet there are the beginnings of positive trends of technology making our lives more meaningful. They need to be pushed through in a more conscious and concerted fashion.

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