

An invitation for commentary to the Foundations of Information Science discussion group led to the following reflections by Birger Hjørland of the Royal School of Library and Information Science, Copenhagen, Denmark.

Stonier's book claims to be about "information science" (IS). Is it? This reviewer claims that he is working in IS (also called "library and information science" (LIS) or sometimes "documentation"). Is he? Are the two claims on the term IS justified? Are they related? If not: Which claim is best founded? These are difficult questions, which I shall try to illuminate.

The reviewer's field "information science" is established with many journals, conferences, schools and institutions. Stonier's book does not refer to one single journal of information science. (It does cite a few books or authors in LIS, but this is rather peripheral). Thus, the two fields seems not related—at least at the first sight.

One criteria for a science is that there exists an organization of researchers with research institutions, journals, conferences and so on. This could be called the sociological criteria of a science. In this meaning of the word "science", LIS evidently has the best founded claim to be *the* IS.

The sociological criteria is, however, not sufficient. In the sociological sense, fields like parapsychology can claim to be sciences. Most researchers would, however, reject that parapsychology is a science. Thus normative, epistemological criteria are another set of criteria, which must be applied in the definition of a science. Therefore has Stonier's claim still a possibility of being the most true?

How do we determine the meaning of a word such as, for example, "information"? Machlup (1983) uses the etymological method. Based on this he claims, that information always involves a human informant: some person informing (tells) others about something. All other uses of the word "information" are, according to Machlup, only metaphorical uses. To say that DNA contains "information", that it "tells" us about our properties is, according to Machlup only metaphorical speech. IS can only deal with human social communication. We can call this definition of information for "human information" or just "h-information".

“H-information” is clearly different from information measured in bits (e.g. on a disc). This is the electronic-engineering meaning of information (“e-information”) derived from Shannon’s famous theory from 1948. However, it has been questioned whether the term “information” is rightfully applied to this theory, or whether it should have been called something else. However, this is only a question of terminology. Nobody doubts that “information theory” is one of the most important theories in the 20th century. Now we have two problems: (1) Are h-information and e-information related? (If not: which meaning is then the most adequate?) (2) Is “information theory” (Shannon, 1948) an adequate or useful theory concerning h-information?

Back to the problem regarding methods of defining a term. To a certain degree scientists are free to choose a term in their theories. To a certain degree terminology is only a matter of *convention*. However, the application of a word may be more or less adequate; it may be more or less in harmony or in conflict with other uses of the same word. A scientific application of a word in a new theory may influence the ordinary understanding of that word. In my view Shannon’s use of the word was not adequate, but his theory has been very influential, and has influenced the ordinary meaning of the word—and has made the word more ambiguous.

Many scientists in many disciplines apply the term “information” because it is very prestigious. The problem is whether they apply it with the same meaning? Bogdan writes:

“My skepticism about a definitive analysis of information acknowledges the infamous versatility of information. The notion of information has been taken to characterize a measure of physical organization (or decrease in entropy) a pattern of communication between source and receiver, a form of control and feedback, the probability of a message being transmitted over a communication channel, the content of a cognitive state, the meaning of a linguistic form, or the reduction of an uncertainty. These concepts of information are defined in various theories such as physics, thermodynamics, communication theory, cybernetics, statistical information theory, psychology, inductive logic, and so on. There seems to be no unique idea of information upon which these various concepts converge and hence no proprietary theory of information”. (Bogdan, 1994, p. 53)

Stonier's book, however, seems for me to try exactly what Bogdan has given up: to find a proprietary theory of information, that can provide a new foundation to the problems of physics, computer science, biology, linguistics, cognitive sciences, LIS, and so on. Stonier sees information as a fundamental property of the universe (like matter and energy), and he even suggests that "pure raw information" can be particles ("infons"). He is also concerned with the different levels of information processing systems from atoms to human languages.

Such a project must—in my opinion—be labeled "metaphysical" or "ontological". The word "metaphysics" got a very bad reputation during the period of logical positivism in the beginning of the 20th century. But with the decline of logical positivism, the study of metaphysics seems to have got a new legitimacy. Stonier, however, does not quote or discuss other theories in metaphysics (e.g., "general systems theory" or "dialectical materialism") and does not seem to be informed in this area or to regard himself as doing metaphysical work.

In my opinion, this book is of little direct importance to what I regard as IS, although it represents one clear perspective and contains several insightful observations and analyses. For example, on p. 50, Stonier states, that our universe is filled with many different kinds of information processing systems (IPSs), operating on entirely different principles, both in how they transmit information and in how they store and retrieve it ... YES, I certainly agree, but a more or less explicit premise in his book is the idea that you can build information systems based on principles developed in a "general information science" comparing the levels of IPS in the world. Such a perspective is most problematic in what it leaves out: the study of the different and concrete tasks that the IPS are going to be designed for.

I am afraid that its reductionistic perspective on meaning can do much more harm than good. If we are going to design information systems for human beings, we must understand how our needs for information, our consciousness, our language, our meanings, and so on, are shaped by cultural influences, by history, by conflicting goals and interests, and so on. This is not what Stonier (p. 35) calls an "anthropocentric conceptualization". It is a realization of

the insight developed by the pragmatic philosophers, that the interpretation of meaning must be “futuristic”. As Charles Sanders Peirce wrote:

“The rational meaning of every proposition lies in the future. How so? The meaning of a proposition [its logical interpretant] is itself a proposition. Indeed, it is no other than the very proposition of which it is the meaning; It is a translation of it. But of the myriad’s of forms into which a proposition may be translated, what is that one which is to be called its very meaning? It is, according to the pragmatist, that form in which the proposition becomes applicable to human conduct, ... that form which is most directly applicable to self-control under every situation and to every purpose. This is why he locates the meaning in future time; for future conduct is the only conduct that is subject to self-control”. (Peirce, 1905)

Stonier’s approach to IS, in seeking general mechanism behind meaning developed in the past, and almost totally neglecting the cultural aspects of information and meaning, is in my opinion dangerous, because such approaches seeming “scientific”, “neutral”, and “efficient” in reality can only formulate principles on how to built information systems, which can solve problems of the past, instead of building information systems for the future.

However, I do see a need for modern theories trying to describe the development of different levels in the universe (e.g., the inorganic, the organic, the psychic, and the cultural). On the development of psychological levels, I find Leontyev’s (1981 and 1978) theory very fruitful. I also find that more abstract theories of “systems” and “information” may be able to play a role in and across the single sciences in the same way as mathematics and epistemology does.

However, as an IS concerned with the design of information systems for human beings, my recommendations for a theoretical foundation are very different from those of this book (See Hjørland, 1997).

References

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Tom Stonier's Response

Alan Combs' review of *Information and Meaning: an Evolutionary Perspective* is most generous. This is particularly true in the light of Combs' statement: "I found myself arguing with just about every page". The review is a tribute to Alan's open-mindedness.

The same cannot be said for the review by Birger Hjørland. I should Confess that Hjørland's opinion that the ideas presented in *Information and Meaning* are "dangerous", filled me with glee. The main motivation for writing *Information and Meaning* was, of course, to create a theoretical framework for the interrelated phenomena of Information, Intelligence, and Meaning. However, among secondary motives was the desire to shake up those practitioners of the library science/semiotics community engaged in a sort of anthropocentric masturbation in which they will not admit that computers exhibit aspects of intelligence, or even that a molecule of DNA contains information.

In my view, it is not until library scientist and semioticians understand information to be a basic property of the universe, and not an invention of the human brain, will they come to understand the problems they face in deciphering the human mind or its collective social intelligence. My impression is that Scandinavian colleagues in

particular, as illustrated by Hjørland, have become stuck in the mud of neo-Peircean dogmas. The trouble with quoting Charles S. Peirce is that his brilliant mind and wide interests allow one to choose among many quotes to back up one's epistemological position. Even more troubling is the fact that Peirce never had the experience of computers.

I am glad that Hjørland differentiated between "human" and "electronic engineering" information. One of the great unresolved problems is to establish the equivalency of one form of information with another. The transduction of information occurs all around us and within us (both in our minds and in our bodies). Historically, we, the information scientists, are at the same stage the early 19th Century physicists were before Joules came along. The trilogy on Information, Intelligence and Meaning does not solve all the problems confronting us, but it does provide an intellectual framework with which we can gain an overview.

One final point: the assumption that information has a "reality" of its own—a reality as defined by Peirce: a thing is real if it exists whether we think about it or not—allows us to resolve the age-old mind/brain problem. The brain turns out to be a biological device evolved to create a virtual reality representation of the real world. Like a hologram, or a record playing Beethoven's Ninth, the brain is a biological equivalent of these information transducing devices which are able to simulate a physical object or a symphony orchestra.

Tom Stonier