Birger Hjørland's Manichean Misconstruction of Marcia Bates' Work

By Marcia J. Bates

Abstract

It is argued and demonstrated that Birger Hjørland's critiques of Marcia Bates' articles on the nature of information and the nature of browsing misrepresent the content of these articles, and further, frame the argument as a Manichean conflict between Hjørland's enlightened "discursive" and social approach versus Bates' benighted behavioral approach. It is argued that Bates' work not only contains much of value that has been ignored by Hjørland but also contains ideas that mostly complement, rather than conflict with, those of Hjørland.

Hjørland's Manichean Divide

If one instance constitutes an example, then two instances suggest a trend. Twice now, Birger Hjørland has critiqued my articles, first those relating to the concept of information (Bates, 2005a, 2006, 2008; Hjørland, 2007, 2009), and second, regarding my article on browsing (Bates, 2007b, Hjørland, 2011). In both cases, he has set up a Manichean opposition between key ideas in my work and his. Apparently, from his standpoint, if his ideas have value then mine cannot; the two perspectives stand in inalterable opposition to each other. In his view, his ideas represent the light, and mine are misguided, lost in the darkness.

In this article, I wish to demonstrate how much Hjørland has misconstrued my work and encouraged his readers to reject my ideas based, in part, on what he has misrepresented or misunderstood about those ideas in his work. Only some of the more significant misconstructions will be addressed. In the end, the best source of understanding about my articles is to read the articles themselves—without bias or preconceptions.

On Information

In response to my information articles, Hjørland ([2007](#)) launched his critique with an abstract stating that:

> This article contrasts Bates' understanding of information as an observer-independent phenomenon with an understanding of information as situational…,. The conflict between objective and subjective ways of understanding information corresponds to the conflict between an understanding of information as a thing or a substance versus an understanding of it as a sign. (p. 1448)

It would be hard to exaggerate how inaccurate this representation of my ideas was in this abstract (and in the rest of the article). For example, I do not believe that information is a thing or a substance—quite the contrary—and never wrote about it that way, and I did write about semiotic aspects of information. A much fuller commentary on Hjørland's article is provided in Bates ([2008](#)). Here, however, attention is drawn to the other main characteristic of his discussion of my work: Hjørland's persistent pattern of seeing Manichean contrasts between his work and mine (whether he represents my work accurately or inaccurately).

In the case of the information articles, he insistently portrayed my definition as a hard contrast with his, and claimed that my definition was of information as "objective" and his as "subjective." As I noted in Bates ([2008](#)):

> Hjørland seems unwilling to countenance the possibility, expounded in my articles, that information, differences, in the universe can exist in some objective sense while at the same time, we humans observe those differences according to our own subjective perspective, whether that of an individual with numerous idiosyncrasies or as a member of an intellectual community that approaches those differences out of a specific conceptual paradigm. (p. 843)

This is not to say that there are no real differences between his and my approaches; there certainly are. But, rather than debating the specific differences between the positions, Hjørland created a caricature of my ideas, portraying them as simplistic and as contrasting sharply with his approach.

Ironically, in writing the original articles on information, I saw those articles as a sort of down payment on a larger project of conceptualizing information in both objective and subjective

senses. I felt that the human-independent senses of information should be established first, to be followed later by development of the human-centered subjective aspects. However, because the current strong preference in information science and the social sciences generally is for the subjective perspective, I added a little on the subjective to demonstrate that the subjective could be seated quite comfortably within the objectivist approach taken there. (Actually, the subjective/objective contrast is a rather tired and simplistic opposition by these days. We have new and better ways to address it, but my original objective was not primarily driven by an interest in that issue but rather by an interest in accounting for the several key senses of information as needed by information scientists. Those senses include what could be called objective and subjective approaches.) Unfortunately, age and health issues will probably prevent me from completing that larger project on information.

But Hjørland's insistence on contrasting the subjective and the objective in the discussion of information—instead of recognizing the ways in which they dovetailed together in my presentation of the ideas—enabled him to portray his ideas as the enlightened, new socially aware understanding, and mine as the old reductive scientific approach. This may be an effective rhetorical strategy for those not reading closely, but it grossly misrepresented my work, as I argued earlier (Bates, 2008).

On Browsing

In his recent article (Hjørland, 2011) on my model of browsing (Bates, 2007b), Hjørland continued the same Manichean contrast between his "discursive turn" and what he sees as my purely biological representation of the act of browsing. In a section titled "An Alternative View Based on the Theory of Knowledge" (Note the one-or-the-other positioning again.), Hjørland stated:

> Bates (2007b) speaks of browsing as a kind of exploratory behavior, whereas I would suggest we should speak of it as a kind of orienting strategy. Unlike Bates, I do not think of browsing as a totally random exploration, and the word "strategy" clearly indicates that. (Hjørland, 2011, p. 599)

He also stated that:

> I suggest that browsing is related to orienting strategies and that the difference between more systematic kinds of searching and browsing is related to theories and metatheories held by the persons acting. (p. 599)

I do not think of browsing as totally random and I have no trouble with the idea that people may have actual specific thoughts or philosophies in mind that lead them to browse certain types of resources and not other types. In my view, human beings are mammals, we have developed certain physical and neural ways of processing the exploration of things or ideas out in the world, and we also are capable of highly sophisticated thinking that may draw on different disciplinary philosophies that populate and orient our thinking. So the fan of the discursive turn will no doubt search in different literature than will the fan of the biological turn. I would argue, however, that the adherents of both "turns" browse physically and cognitively in very similar ways that are rooted in our history as exploratory, motile animals hunting for food and nesting opportunities (see evidence presented in Bates, 2007b, pp. 8–11).

Hjørland (2011) argued that people choose places to browse based on theories and metatheories they have. He provided a shopping example. Here is part of his example:

> When different shops are being browsed, they are preselected (consciously or unconsciously). Some shops may seem too far away, some too expensive, others too low-class.,… We can say that shops and departments are selected by metatheoretical criteria. If a theory is a theory about which shop is best, then a metatheory is a theory about how to evaluate your theory, or which criteria should guide your choice of theories. (pp. 599–600)

Here, Hjørland is simply not talking about the same thing that I was. I was writing about the act of browsing and what it is like. He is writing about why you might go one place or the other to browse. Many theories, purposes, intentions, ideas (mistaken or otherwise), and interests can lead you to choose one place or the other to shop in or to look for information. I did not address those choices in my article. I addressed the nature of the act of browsing. Browsing may, in turn, be driven by thoughts and motivations, but my emphasis is on the behavior. There is no conflict here. Hjørland's article and my article do not represent different theories on the nature of browsing itself; only my article addresses that.

Our behavior is of course not just like that of other animals—we humans have our own complex physical and cognitive characteristics that overlie our roots as mammals and which play into browsing—but I do argue that browsing ultimately arises out of that substrate of animal behavior. That underlying behavioral pattern or tendency is then shaped by the specific characteristics of our species as well as by the social and intellectual orientations that are specific to human individuals and to the society in which they live. As an academic, I may browse in the bookstore in the airport; a newspaper food critic, on the other hand, may browse in the airport shop selling specialty foods from the host country. I am interested in reading things in numerous categories of intellectual interest (or gossip); the critic is interested in new tastes and trends in the food business of the host country. The food critic may, in fact, have dyslexia and dislike reading except when absolutely necessary. But, I would argue, she and I will browse through our respective shops in ways that very much resemble each other behaviorally.

To be still more explicit, in my view, human beings have more or less similar ways of browsing, and can impose on that behavioral substrate a vast range of reasons, philosophies, and orienting strategies for doing what they are doing and where they are doing it. There is no conflict between Hjørland's view that people make different choices in where and what they browse, based on their orienting strategies or other reasons, and my view that browsing is of a certain physical and behavioral character.

My Actual Position

In fact, long before I wrote the articles on information and browsing, I expressed my philosophy regarding information seeking and searching in a 2002 paper (Bates, 2002b):

> Scientific approaches are frequently seen as inherently reductive, that is, they are assumed to be explanations that seek to reduce understanding of the social and spiritual in life to the merely physical. While there have long been, and probably always will be, people who attempt such a reduction, there are also many who do not, including myself. Studying something from a natural science point of view does not automatically mean that one is claiming that only the natural science matters or can teach us something. In my view, our understanding of information seeking is not complete as long as we exclude the biological and anthropological from our study. *To focus only on the social and humanistic is simply to be reductionist in the other direction!* [emphasis added] (p. 1)

I then went on to present an "integrated model of information seeking and searching," in which I presented human experience and existence as being composed of integrated layers of reality that are usually studied by different disciplines (biology, anthropology, psychology, history, philosophy, etc.), but the results of which can be integrated ultimately into a single understanding. I used the example of language:

For example, it is generally agreed in the field of psycholinguistics that human beings have some sort of in-born language capacity that puts some constraints on the nature of the languages that can be developed. Within those constraints, however, language can and does have the huge variety that real-world languages show.,… Thus, the particulars of the language a person speaks, the grammar and vocabulary, must all be learned during an individual's lifetime, and vary tremendously from culture to culture. So language capacity is neither totally biological nor totally social, but a complex mixture of both. Many other aspects of human behavior could be described with similar complex mixes across the layers. (Bates, 2002b, p. 3)

In my view, it is just as misguided to think of human beings as only social creatures—with the physical and behavioral totally ignored—as it is to think of human beings as only physical animals without language and sophisticated thought. No complete understanding of humanity can come about without thinking and learning about all levels of our being.

Hjørland's Problem with "Behavior"

Part of Hjørland's line of argument in his 2011 article is to disparage a behavioral approach. He noted that:

> … the basic aim of the present article is to uncover the fundamental assumptions in different traditions, to consider the drawbacks in behavioral views, and to put forward an alternative view on browsing based on views related to "the social turn" in both psychology and IS. (p. 598)

He discussed "behavior" at several points in the 2011 article, and did some curious things with the word. At points, he recognized "behaviorism" as the mid-20th century movement in psychology that took an extremely reductive, and now largely discredited, approach to all things psychological, and the terms "behavioral" and "behavioral sciences" as being something different and more general. Yet, he also used the latter terms as more or less representative of behaviorism when it suited him.

For example, in Hjørland's (2011, p. 598) Table 2, comparing paradigms to grouping of disciplines, he put behaviorism and ethology in the "behavioral sciences" category. He mentioned no other fields that would normally be called "behavioral science." This tactic achieves a guilt-by-association (with behaviorism) image for "behavior" that is totally undeserved. In the American context, the terms "behavior" and "behavioral sciences" have long since come to mean the study of simply that—behavior—and are no longer associated with behaviorism despite the similarity in the words' roots.

Hjørland did a similar thing in considering David Ellis' (1989; as cited in in Hjørland, 2011) work entitled "A Behavioral Approach to Information Retrieval System Design." Hjørland (2011) stated that:

> It should also be said that Ellis' article is first and foremost descriptive and classificatory and it does not try to explain behavior and does not relate to the interdisciplinary literature in which discussions about behaviorism take place. (p. 595)

Again, behaviorism is brought up where it is quite irrelevant, and made to seem, somehow, as connected in modern research to the study of behavior. As Hjørland (2011) himself noted, behaviorism had quite faded by the early 1970s.

This tactic of discrediting the study of behavior even leads Hjørland (2011) to make a surprising claim. He referred to the editors of the 2001 International Encyclopedia of the Social & Behavioral Sciences, as follows:

> In spite of the fact that Smelser and Baltes (2001) regard their work as a revised edition of the International Encyclopedia of the Social Sciences and in spite of their decision to include the concept "behavioral sciences" in the title, this work does not contain any article about behavioral sciences. (Footnote 11, p. 602)

The 26-volume Encyclopedia of the Social & Behavioral Sciences contains not a single article about behavioral sciences? Does Hjørland mean an article devoted solely to the concept of behavioral sciences, or does he mean that behavioral science perspectives are not present in the encyclopedia, despite the title? If the latter is intended, he is making an extraordinary claim— that the editors do not even understand their own disciplines!

The Introduction to that encyclopedia addresses the decision to include "behavioral" in the title. The editors stated that the decision led them to increase substantially the coverage of

psychology, the ultimate behavioral science field, and to add the following specific "behavioral fields bordering on the biological sciences":

- Evolutionary science

- Genetics, behavior, and society

- Behavioral and cognitive neuroscience

- Psychiatry

- Health (p. xxxiv)

One final point about Hjørland and these various research paradigms: He sees the discursive turn as the correct view of social and behavioral phenomena and, essentially, devotes his article to demonstrating that it is the best paradigm. And while I agree on the value of being clear on the intellectual paradigms or philosophies that we work out of, too rigid an adherence to a particular popular point of view can blind one to other important realities. In the early days of behaviorism, its adherents went to extreme lengths to support their view, being rather like the boy who receives the gift of a hammer and thenceforth thinks everything in his environment needs to be hammered. In the early days of every new conceptual paradigm, its adherents try applying its core ideas to everything in their environments. This leads to sometimes absurd overreaching. As a graduate student in the late 1960s, I cut my teeth on Noam Chomsky's (1959) famous scathing review of B.F. Skinner's book Verbal Behavior, which marked the beginning of the end for behaviorism in psycholinguistics. In Chomsky's review, the unsuitability of the stimulus–response model to language learning became stunningly evident.

At the same time, though psychology has long since moved on from behaviorism, there are still areas in psychology where the understanding gained about stimulus–response situations continues to be seen as accurate and is helpful in certain kinds of psychological disorders. My point here is that after that initial "hitting-everything-with-a-hammer" phase, most disciplines come to see the limits of particular paradigms, and come to apply the learning developed during that phase to a smaller and more appropriate range of things than they did during the "high-water" phase of interest in the paradigm.

Right now, in the reign of the social/discursive turn, we are seeing that paradigm applied to the same extremes. In books such as The Manufacture of Knowledge (Knorr-Cetina, 1981; also see Knorr-Cetina, 1999), scientific work is seen as being so wholly dominated by its social context

that the results of science are construed as being largely socially manufactured. In fact, the famous skewering of the social turn, one that can be considered equivalent to Chomsky's ([1959](#)) review of Skinner, came with the "Sokal Hoax," the publication by the physicist Alan Sokal of a sham postmodernist article in the journal Social Text (Segerstrale, [2000](#)), thus apparently completely fooling the journal's editors. The recognition of the role of the social in producing all human endeavors, including science, is a very valuable understanding to bring to the study of science, but like the boy with the hammer, can be taken to extremes that will/should be dropped later, when the limits of the discursive paradigm are recognized.

So, as noted earlier, while consistency between one's intellectual paradigm and one's conduct of research is desirable, it also is desirable to have a judicious view of all social science paradigms, and to recognize that they are each one way of constructing an understanding in research, but that over the long-term, any single paradigm is almost certainly not the only good or complete way of understanding the phenomenon being studied.

I particularly like and concur with the following statement by Smelser and Baltes ([2001](#)):

> Indeed, we believe that a new and proper perspective in the social and behavioral sciences demands more explicit consideration of the biological and cultural "co-construction" of behavior and society than has been true in the past…,. (p. xxxiv)

It is precisely that conception of the "co-construction" of the social and behavioral that animates much of my work.

What Is Lost in Hjørland's Manichean Divide

Hjørland has a gift for making provocative statements, and it is easy to get caught up in the verbal storm around his articles that are supposedly deconstructing the weaknesses in my work. What particularly distresses me about his critique articles, however, is that he usually ignores the most valuable contributions of my work. In reading Hjørland ([2007](#), [2009](#), [2011](#)), therefore, it would appear that my articles have little to say that is original or valuable, and they are full of nonsensical ideas, which he kindly offers to correct, for the greater edification of the field of information science. In this way, whether intended or not, he manages to present my work as that of a befuddled character with nothing much of value to say, who cannot even tell the difference between the subjective and objective nature of information or who fails utterly to see that the browsing behavior of human beings might be animated by thoughts and interests rather than purely by random, directionless expenditures of energy. Such a befuddled character cannot then

contribute anything of substance to the field, right? It is a potent rhetorical strategy, but one which I hope readers will ignore by going back to my original work with an open mind (Bates 2005a, 2006, 2007b).

So, in this section, I want briefly to address what I was attempting (and believe that I at least partially achieved) in the several articles under discussion.

In the articles on information, I wanted to develop a from-the-ground-up understanding of this concept at the very heart of our field. We need something in this field that enables us to coalesce around this core concept, and to be able to use the term with some understanding and a modicum of agreement. I specifically set out to define the term in a way that research and practice in information science could be based and built upon. Though the term obviously has countless uses in other fields, I wanted to conceptualize information in ways that both researchers and professionals in the information disciplines could effectively use.

In my own recent work as Editor-in-Chief of the seven-volume Encyclopedia of Library and Information Sciences, third edition (Bates & Maack, 2010), I defined the information disciplines as follows:

1. Archival science

2. Bibliography

3. Document and genre theory

4. Informatics

5. Information systems

6. Knowledge management

7. Library and information science

8. Museum studies

9. Records management

10. Social studies of information. (p. xiii)

I make no claim that these are the only information professions or disciplines—only that they all at least deserve to be considered among the information fields (for a fuller discussion of the issues and rationale in this choice, see Bates, 2007a). It is those fields that I hope will be able to build upon my conceptions of information and information types for their work.

In the information articles (Bates, 2005a, 2006), I linked three levels of information—the biological, cultural, and exosomatic (external to the body)—into a single model, and proposed several types of information that are of fundamental value for the information disciplines. Eighteen concepts were rigorously defined: from Embedded, Embodied, and Encoded Information to Recorded Information and Trace Information. For example, trace information (the residue that is incidental to living processes or which remains after living processes are finished with it) can be seen as the particular focus of museum and archival studies while recorded information of many types is the focus of several information disciplines. These concepts are tailor-made for the practices and uses of people in the information disciplines, and I hope that others will build upon them.

The uses of these concepts came together in a photograph (Bates, 2006, Figure 1, p. 1040) that presented the major forms of information that I had identified. I cut that photograph out of a 1987 Los Angeles Times article—in 1987—because I knew it had what I wanted, nearly 20 years before the actual article was completed and published. I mention this only because it shows how long these ideas had been germinating. These concepts were deeply thought through, and deserve the attention of anyone with an interest in the nature of information.

In the browsing article (Bates, 2007b), my chief objective was to unseat what is by far the most common understanding of browsing—that it can be characterized as "scanning." I believe there is a very distinct, and much more accurate, characterization of browsing that can be made, which understanding can then be the basis for a different and superior design of information system interfaces, not to speak of a superior understanding of the human behavior of browsing itself. In studying the act of browsing, I assume that it can be seen as a "combined cognitive, motivational and behavioral pattern" (Bates, 2007b, p. 6). As noted earlier, however, my emphasis is on the visual and physical behavior of the act of browsing itself.

Note that we do scan; I am not arguing that people do not do that. Rather, I am arguing that scanning is not at the heart of browsing:

Browsing is the activity of engaging in a series of glimpses, each of which may or may not lead to closer examination of a (physical or represented) object, which examination may or may not lead to (physical and/or conceptual) acquisition of the object. (Bates, 2007b, p. 6)

> Browsing is not a smooth scan. I glimpse one section of the magazine stand, seize something interesting within it, put it back, then glimpse again. (Bates, 2007b, p. 8)

The book Accessing and Browsing Information and Communication by Rice, McCreadie, and Chang (2001) contains the most comprehensive review of the nature of browsing of which I am aware. I make the case at greater length in Bates (2007b), but I would argue that browsing-as-scanning is at the heart of virtually all discussions of browsing. Rice et al. do not themselves limit their model of browsing to scanning but the latter behavior is a key element (for a more detailed discussion, see Bates, 2007b.)

Because of this browsing-as-scanning assumption, most interfaces that are designed for browsing consist of lists for scanning down. If you want to browse, the system provides you a list to scan down. But, in fact, at the physical level, people browse by glimpsing here and there. They make a very superficial fix on objects in their environment, and when that preliminary sizing-up suggests something of interest, they then look more closely at it, and take the time and cognitive effort to identify and examine it. They are likely to do this whether in the library, the bookstore, or the specialty food shop at the airport. And they do this whether they believe in the "discursive turn" or classical empirical science.

When we stand in front of a newspaper stand, we do not scan the shelves systematically and sequentially from top to bottom or left to right. Rather, we glance here and there in rather random movements. This behavior is actually more efficient in evoking things that might interest us than is systematic scanning because we use that quick glance to see the general outline of things that we then can look at more closely. (These movements are random in the choice of where to fix the eyes, but not random with respect to what we choose to examine more closely within that visual field. The latter choice is based on our interests.) If, instead, we scanned serially from left to right, we would not see interesting possible objects to view off to the far side because that would be outside the limit of peripheral vision. I will not reprise the whole argument here, but I found research in both psychology and behavioral ecology that was strongly supportive of this approach, and in surprising and specific ways. I brought this work from other fields together with that in information science to achieve a new and significantly different

understanding of browsing—an understanding that should benefit all the various source disciplines.

For information science, such an understanding of browsing enables us to characterize more accurately what people do in the actual act of browsing, and thereby enrich our understanding of information-seeking behavior. In information system design, we can design interfaces in ways that harmonize better with how we actually physically browse than do the current lists-for-browsing. For example, browsing interfaces can be designed with icons scattered various places on the screen, each representing a search capability or a cluster of information resources, rather than solely with long lists. Again, I urge the reader to return to the original work (Bates, 2007b).

In sum, Hjørland considered my articles on information without seriously addressing their intended contributions to an information-disciplines-specific understanding of the concept; and he discussed at length the browsing article without seriously addressing the core focus of the article, which was to propose a new conception of browsing to replace the common one of browsing-as-scanning, and to suggest implications for information system design arising out of that different conception of the term.

Conclusion

In critiquing two areas of my work, defining information and defining browsing, Hjørland's articles ignore most of what is original and valuable in my work and create a Manichean opposition between his views and mine. In most cases, there is room for both his and my views, if seen in a larger framework of an integrated model of the concerns of information science.

- Bates, M.J. (1979). Information search tactics. Journal of the American Society for Information Science, 30(4), 205– 214.
-
- Bates, M.J. (2002a). Speculations on browsing, directed searching, and linking in relation to the Bradford distribution. In H. Bruce, R. Fidel, P. Ingwersen, & P. Vakkari (Eds.), Emerging frameworks and methods: Proceedings of the Fourth International Conference on Conceptions of Library and Information Science (CoLIS4) (pp. 137– 150). Greenwood Village, CO: Libraries Unlimited.
-
- Bates, M.J. (2002b, September 11). Toward an integrated model of information seeking and searching. Keynote Address of the Fourth International Conference on Information Needs,

Seeking and Use in Different Contexts, Lisbon, Portugal. New Review of Information Behaviour Research, 3, 1– 15.

-
- Bates, M.J. (2005a). Information and knowledge: An evolutionary framework for information science. Information Research, 10(4), Paper No. 239. Available at: http://Informationr.net/ir/10-4/paper239.html

-
- Bates, M.J. (2005b). An introduction to metatheories, theories, and models. In K.E. Fisher, S. Erdelez, & L. McKechnie (Eds.), Theories of information behavior (pp. 1– 24). Medford, NJ: Information Today.
- Bates, M.J. (2006). Fundamental forms of information. Journal of the American Society for Information Science and Technology, 57(8), 1033– 1045.

-
- Bates, M.J. (2007a). Defining the information disciplines in encyclopedia development. Information Research, 12(4), Paper No. CoLIS29. Available at: http://Informationr.net/ir/12-4/colis/colis29.html

- Bates, M.J. (2007b). What is browsing-really? A model drawing from behavioural science research.Information Research, 12(4), Paper No. 330. Available at: http://Informationr.net/ir/12-4/paper330.html

- Bates, M.J. (2008). Hjørland's critique of Bates' work on defining information. Journal of the American Society for Information Science and Technology, 59(5), 842– 844.

- M.J. Bates, & M.N. Maack (Eds.). (2010). Encyclopedia of library and information sciences (Vols. 1–7).New York: CRC Press.

- Chomsky, N. (1959). Review of B.F. Skinner's Verbal Behavior. Language, 35(1), 26– 58.

- Ellis, D. (1989). A behavioural approach to information retrieval system design. Journal of Documentation, 45(3), 171– 212.

- Harter, S.P. (1992). Psychological relevance and information science. Journal of the American Society for Information Science, 43(9), 602– 615.

- Hjørland, B. (2007). Information: Objective or subjective/situational? Journal of the American Society for Information Science and Technology, 58(10), 1448– 1456.

- Hjørland, B. (2009). The controversy over the concept of "Information:" A rejoinder to Professor Bates. Journal of the American Society for Information Science and Technology, 60(3), 643.

- Hjørland, B. (2010). The foundation of the concept of relevance. Journal of the American Society for Information Science and Technology, 61(2), 217– 237.

- Hjørland, B. (2011). The importance of theories of knowledge: Browsing as an example. Journal of the American Society for Information Science and Technology, 62(3), 594– 603.

- Knorr-Cetina, K. (1981). The manufacture of knowledge: An essay on the constructivist and contextual nature of science. Oxford, England: Pergamon Press.

- Knorr-Cetina, K. (1999). Epistemic cultures: How the sciences make knowledge. Cambridge, MA: Harvard University Press.

- Rice, R.E., McCreadie, M., & Chang, S.J. (2001). Accessing and browsing information and communication. Cambridge, MA: MIT Press.

- Segerstrale, U. (2000). Stirred, not shaken. Science, 290(5497), 1703– 1705.

- N.J. Smelser, & P.B. Baltes (Eds.). (2001). International encyclopedia of the social & behavioral sciences (Vols. 1–26). Amsterdam, The Netherlands: Elsevier.

- Sperber, D., & Wilson, D. (1986). Relevance: Communication and cognition. Cambridge, MA: Harvard University Press.

- White, H.D. (2007a). Combining bibliometrics, information retrieval, and relevance theory, Part 1: First examples of a synthesis. Journal of the American Society for Information Science and Technology,58(4), 536– 559.

- White, H.D. (2007b). Combining bibliometrics, information retrieval, and relevance theory, Part 2: Some implications for information science. Journal of the American Society for Information Science and Technology, 58(4), 583– 605.