The papers on artificial intelligence, by Suppe, Charles Rieger, Frederick Hayes-Roth, and Heilprin, approach the problem from different directions, including: dealing with the black noise (non-Gaussian distribution of values) in real communication situations, achieving closure on alternatives in machine comprehension of text through hypothesis rejection, formulating the structure of ambiguity in order to facilitate comparison or matching, characterizing the process by which humans achieve acceptable abstractions of the characteristics of records or other objects.

The papers on the human recipient system, by David Harrah, George Stiny, and Heilprin, deal with the probabilistic perception of truth in messages that are received and analyzed, the possibility of developing a system language that incorporates adequate approximation of recipient affect (feeling and response toward the object or message), and explication of the unidirectional flow of information in human recipients and the necessary coupling among the communication channels that are involved. There are two papers in the final group on interpretation in observation and communication—the process by which an information recipient becomes informed, whether or not his system produces an output response. Suppe reinforces his earlier analysis of the role of black noise. Heilprin demonstrates mathematically that cognitive development in a recipient consists of associating the "variety" (information richness) of different objects or observations to form larger classes with lowered variety, i.e., abstract levels and hierarchies. Because of the brain's information channel limitations, logical thought and the communication of thought cannot occur until this cognitive development reaches some threshold of sufficiently high abstraction (low variety).

This is an important book, worth considering for personal collections. It should certainly be in every collection that is intended to serve researchers and system developers in information science and in related fields such as librarianship, management systems, cognitive studies, and education. Perhaps its greatest value is that it provides the means for a person who is a relative stranger to the theoretical aspects of information systems to quickly gain familiarity with the major lines of thought and the problems to be resolved. Most of the papers include lists of references or bibliographies that provide entrée to the relevant literature. The time lapse between original presentation of these papers and their publication is immaterial. This book is not concerned with transient details of technology. It is concerned with the discovery of the fundamental concepts and relationships that shape technology. Such foundations develop slowly. In information science they are by no means well developed yet, but the prospects are bright. And, even in their immature state, the concepts and relationships discussed in this book offer us convenient shortcuts to the threshold levels of mental abstraction that are necessary, as Heilprin explains, for productive thought.

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The Mind's New Science: A History of the Cognitive Revolution. H. GARDNER. Basic Books, New York, NY (1985). xv + 423 pp., $22.50, ISBN 0-465-04634-7.

For years I have been uneasy in the face of the increasing number of information scientists I encounter who seem firm in their conviction that the only viable foundation for an "information science" is the empirical analysis of the documentation in scholarly literatures. In this version of information science, bibliometrics is the theory and citation analysis is the method. A number of things trouble me about this notion, but foremost is the disquieting feeling that this paradigm would place information science at the very margins of the emerging information society. That is, I can not understand the intensity with which advocates of this paradigm insist that somehow bibliometrics is a mirror of nature.

And yet, despite my concerns about the inadequacies of the dominant paradigm candidate in information science, I found myself at a loss to imagine one that would be as persuasive and focused as the bibliometric model seems to be. Until now, that is, for I would like to suggest that Howard Gardner's *The Mind's New Science* offers us a detailed and forceful argument for a new cognitive science with significant implications for information scientists, and especially information science educators who are struggling to design curricula to meet the needs of the U.S. information industry.

Gardner, A MacArthur Prize Winner and author of the award winning *Frames of Mind: The Theory of Multiple Intelligences* (Basic Books, 1983), has written a brilliant analysis of what he terms the "cognitive revolution." It is impossible to adequately summarize this dense and interdisciplinary probe, but we can suggest what seem to be its central implications for information scientists.

Gardner's argument is complex, but essentially he insists that a revolutionary new "Cognitive Science" has been emerging in the United States since the early 1970's. While this new cognitive science

has historical and philisophical roots running back to the ancient Greeks, it is also "radically new." The central concerns of this new science are the nature of knowing; conjecture about the various vehicles of knowledge; and the role of language in communication. Gardner insists that the new science is also uniquely interdisciplinary, empirically oriented, and inextricably wedded to the computer as a key to the cognitive puzzles being investigated. More explicitly Gardner defines cognitive science as a "contemporary, empirically-based effort to answer long-standing epistomological questions – particularly those concerned with the nature of knowledge, its components, its sources, its development, and its deployment" (p. 6).

Gardner proceeds in three stages. First he attends to cognitive science as one with a "long past but a relatively short history," and briefly traces the antecedants of the field with special attention to recent developments such as information theory, computers, and the cybernetic synthesis. Second, he presents breathtakingly sharp interpretations of the six disciplines he feels are contributing the most to a radically new cognitive science: philosophy, psychology, artificial intelligence, linguistics, anthropology, and neuroscience. Third, and most controversial in a very controversial book, he presents a daring reading of the work at the intersections of these disciplines which point to what Gardner envisions as a "single, unified cognitive science" (p. 8).

The whole argument is startling and compelling, but it is in part three of his book that Gardner speaks directly to the concerns of those of us grappling with a definition of information science and its intellectual domain. For it is here that Gardner aggressively insists that "the crucial divisions within cognitive science are *not* the traditional disciplinary perspectives but rather the specific cognitive content" (p. 390). His is no simple-minded call for interdisciplinary studies, for he insists that the ultimate goal is to organize scientific training and research enterprises into a "coordinated representational account which covers the full gamut of the traditional disciplines without any need even to mention them" (p. 390).

This is a daring proposal indeed, and its fruits would be no less than a "cogent scientific account" of "complex human creative activity." Whether or not one accepts Gardner's optimistic vision of the potential of a unified cognitive science, his book offers a detailed and informed blueprint of an "information science" that would *not* be founded on bibliometrics.

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AGRIS and International Cooperation for the Exchange of Scientific and Technical Information: Proceedings; Tenth Anniversary Seminar. Food and Agriculture Organization of the United Nations, Rome, Italy (1985). 154 pp. (No ISBN. Free from FAO.)

This book is a compilation of the papers presented at a seminar commemorating the tenth anniversary of AGRIS (International information system for agricultural sciences and technology) and gives the reader insight into the development and operation of an information system indexing materials from many sources, in many languages and unifying them into one information system. The work consists of a dozen short papers, eight written in English and four in French, an introduction, remarks by the Director-General of the FAO, and closing remarks in English, French, and Spanish. Each paper is preceded by an abstract in English, French and Spanish.

The first three papers deal with AGRIS's past. John Sherrod recalls the environment that led up to the concept of AGRIS and the seeking of sponsorship from the FAO. Gerard Dubois reminisces about the bringing together of the expertise to implement the system. Ahmed Fassi-Fihri cites the contributions of the CND (National Documentation Centre of Morocco) including the role it played in producing the experimental issue of AGRINDEX.

Attention is then turned to the role of the AGRIS Coordinating Centre in both national and regional information systems and its interaction with existing systems. In his paper, Angel Fernandez outlines the training, tools, and guidelines provided by AGRIS which enabled the Caribbean and Latin American countries to increase their contribution to and effectiveness in the system. Maria Gal discusses the interaction of AGRIS with existing information systems and the development and provision of services. H. C. Molster recounts the support for AGRIS by the European Community and contributions to the AGRIS system by other European agencies.

The next paper moves from Europe to Asia where Syed Salim Agha discusses the effect of AGRIS on national and regional information systems. This paper describes the role of AGRIS in standardizing the bibliography of the world's agricultural literature and what effect AGRIS has had on the trans-