However, the *Encyclopaedic Dictionary* is not without some very serious flaws in content and organization. While some difficult concepts, such as "workstation," are deftly explained, too often wording is inaccurate or misleading. "Hacker" is only defined in the sense of "cracker" (p. 111; cf. McDaniel), and "bibliometrics" is incorrectly restricted to "the study of bibliographies in scientific articles and books" (p. 11; cf. Watters, p. 19). In an article on programming languages, we are told that "Pascal has displaced Basic as 'the serious programmers' language" (p. 47). Does the author really mean that C is not a serious programmer's language? Readers consulting the *Encyclopaedic Dictionary* for basic information on the subject may very well be misled.

The division of longer topics into separate entries with subheadings arranged alphabetically means that a single subject often extends over separate, arbitrarily arranged sections. This structure, together with the limited cross-references and the lack of an index, make it difficult to find information. Looking for information on thesauri, the reader is referred to "Indexing—Thesauri," but not to almost two pages of information on the topic under "Images—Indexing, Visual Thesauri," and several paragraphs and an important figure (the only reference to the type of relations found in a thesaurus) that appear in the introductory entry "Indexing." The loss is not complete in the latter case, as several paragraphs from this section are repeated, word for word, in the more specific entry on thesauri.

The most serious flaw in the *Encyclopaedic Dictionary*, however, is the lack of a bibliography or list of references, and the inadequate and inconsistent citations throughout the text. This is especially annoying in a reference work aimed in part, at least, at librarians and information professionals. In one only too typical entry, direct quotations are made from "Freedman (1987)," "the book *Information 2000*," and "Eugene Garfield" (p. 89). Who was Freedman? Who wrote *Information 2000*? In what book or article did Garfield make the statement quoted? The reader gets no help in checking up on the references or in finding sources of further information on a topic.

The *Encyclopaedic Dictionary* provides useful information, especially on computer hardware and software issues. Difficult to consult but easy to read, it is more useful for casual browsing than for reference. Given the rapid changes in the field of information technology, this work may still appeal to those who need a handy source for a variety of current information on IT. However its flaws mean it cannot be relied on as a single source for knowledge of information technology and systems, or be easily used as a starting point for exploring the field in more depth.

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Metacognition: Knowing about Knowing. J. METCALFE and A.P. SHIMAMURA (EDS.). MIT Press (A Bradford Book), Cambridge, MA (1994). xiii + 334 pp., $32.50, ISBN 0-262-13298-2.

"Metacognition" is the knowledge people have about what they know, remember, and think. Typical variables investigated in research into metacognition include judgments about "feeling of knowing," ease of learning, and stated levels of confidence felt by people who have learned a fact or a skill. There is a good deal of experimental evidence suggesting that these metacognitive phenomena play a role in monitoring and controlling cognitive tasks such as learning, recalling, and problem solving. For example, someone who thinks that he or she knows a fact will be more likely to spend the time and effort to recall that fact. Someone who feels confident about having learned a skill may be more likely to attempt a task requiring that skill.

This book is a worthwhile addition to the handful of titles on metacognition that have appeared since the mid 1980s. The editors appear to have made an effort to steer away from one main focus on the metacognition literature: classroom teaching and learning. The terms "teaching," "classroom," "reading," and "writing" do not appear in the subject index. Rather, the chapters presented here emphasize the basic concepts and methods of metacognition research, associations between metacognition and neurophysiology, and very general applications of research findings to learning and problem solving, rather than to specific learning situations or tasks.

The result is a convenient, one-volume introduction to the issues and methods of research into metacognition. The editors and the authors of the individual chapters have impeccable credentials as respected researchers in this field. The chapters "Why investigate metacognition?" and "Methodological problems and pitfalls in the study of human metacognition" may be of greatest interest to

readers who wish a survey of this area of research. Those who wish to delve more deeply can examine the chapters on phenomena of metacognition such as tip-of-the-tongue events, the feeling of knowing, and memory monitoring. Three chapters link metacognition to neurophysiology and individual differences associated with aging. Applied research is included in chapters on eyewitness recall, training, and problem solving. The contents are clear and readable, although written at a fairly technical level.

The interest of these topics for members of the information science community needs to be emphasized. A number of information science researchers are engaged in investigations of cognitive influences on information retrieval. User modeling, for example, is based in part on an understanding of the role that cognitive variables play in information retrieval. Cognitive task analysis and cognitive engineering of information systems also require an understanding of the role of cognitive structures, abilities, and styles in determining the usability of information technology. The contribution of this book is to remind us that investigations of cognitive variables are incomplete unless they also study the contributions of metacognition.

Information science researchers must distinguish clearly between cognitive and metacognitive variables, and investigate the contribution of each to information-related behavior. For example, several researchers have investigated the effects of domain or topic knowledge on search behavior. However, in recent unpublished research I found only a slight correlation ($r = .22$) between domain knowledge, as tested using a multiple choice test, and the metacognitive feeling of knowledge, tested by asking users for their perceptions of their familiarity with the topic. If the cognitive and metacognitive variables are to some extent independent of each other, it is important to assess the relative contribution of each to search performance. Similarly, search expertise is recognized as having an influence on searching. However, research into expertise in other complex domains, such as computer programming, suggests that expert knowledge consists of an interaction between metacognitive knowledge, task knowledge, and cognitive monitoring. The challenge for researchers into the cognitive aspects of information retrieval is to develop methods that will allow detailed investigation of metacognitive as well as cognitive variables.

With this in mind, the introductory and methodological chapters in this book are particularly recommended for all researchers interested in cognitive investigations in information science. The remaining chapters also repay a close reading, and may suggest new directions for experimental research in our field.

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From Writing to Computers. J. WARNER. Routledge, London and New York (1994). ix + 159 pp., $49.95, ISBN 0-415-09612-X.

Julian Warner's book ranges over semiotics, the history and nature of written language, Plato's anxieties about writing in the *Phaedrus*, automata theory, Turing machines, the nature of formal logic, and beliefs in the intelligence of computers. Readers seeking introductory treatments of some of these subjects will find much to interest them. The discussion of semiotics in the first chapter, intended only to introduce the concepts of sign, signifier, and signified in order to emphasize that signifiers require human interpreters, is sufficiently brief not to delay readers hoping for more substance. The second chapter (on written language), drawing heavily on the linguistic work of Roy Harris, provides convincing and well chosen examples of non-oral forms of writing, or forms "radically independent of utterance" (p. 30), to support plausible and interesting arguments that writing is not a representation of speech. Little in this chapter is new, and the presentation is labored in places (there is no need to mobilize the heavy machinery of "metalanguage" to make the simple, but useful distinctions between forms of graphic signification, inscription, and document, and private vs public forms of documents), but it is nonetheless persuasive. The third chapter, "Intelligence of documents," is paired with the fifth, "Intelligence of computers," through the argument that "claims for the intelligence of computers and of documents in written language . . . rest on a similar basis: that depersonalized linguistic output was made available, usually at a distance in space and time from its original producer" (p. 126), "without intentionality or understanding" (p. 62). Plato's well known arguments that written language has only the appearance of intelligence because it cannot be interrogated as a speaker can, and Searle's perhaps even better-known arguments against the intelligence of computers, are used to show the error of regarding meaning as "an inherent property of messages" while eliding "the human labour involved in their making and interpretation" (p. 122).