

modern methods of problem-solving, such as computer applications, cybernetics, information theory and operations research, will be highlighted." This chapter presents a good overview of general systems theory, along with a few quotes from Ludwig von Bertalanffy, Norbert Wiener, and others. It is truly a "highlighting" of these topics.

In Chapter 3, "Information," the problem of entropy is discussed in some detail and four examples of it are presented. The point is made that entropy is both an idea and a measurement. In the "Conclusion" section of this chapter, the authors note: "This paper is designed simply to introduce the reader to the entropy concept and hope that he or she will not only recognize the crucial importance of the concept to management, but will also investigate the possibility of further concrete applications" (p. 80). The authors' reference to the chapter as a "paper" leads the reader to believe that this short book was originally a group of individual papers and/or lectures.

The final chapter, "Expert Systems," is short and not up to the same standards as the first three chapters. One would be better informed about expert systems as they relate to information systems by reading Henry A. Sowizral's chapter "Expert Systems" in the *Annual Review of Information Science and Technology* (volume 20, 1985, pp. 179-199), which is just about the same length as the "Expert Systems" chapter in Drechler and Bateson's book.

The book is well documented, and there are many references at the end of each chapter and an ample bibliography at the end of the book. The references to the last chapter are the worst of what is generally a sloppy example of bibliographical editing. The following are the first and last reference for this chapter just as they appear in the book:

1 Winston, P. H. "Artificial Intelligence", 2nd Edition 1984

8 Wildavski [sic], A. "Information as an organisational [sic] problem" Political Science Department, Berkely [sic] California 1980.

One can see that these references are at various stages of completeness and in need of editorial work. There are also a number of typos and formatting problems, which get in the reader's way throughout the book. For example, on pages 14 and 15, Maslow's hierarchy of needs is presented in a two-column format rather than in the customary one-column format.

Although the book lacks an index, the table of contents is sufficiently detailed to negate this problem to a degree. If one were to use this book as a text in a course, it would make a good short introduction to the topics of expert systems and information. It could also serve the general reader as a reasonable introduction and reading list to these two topics and management science as well. The topic of expert systems, however, is addressed too briefly for either audience. The selling points of this book are its brevity and clarity, both of which make it a reasonable acquisition for large libraries.

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Intelligent Information Systems for the Information Society: Proceedings of the Sixth International Research Forum (IRFIS 6). B. C. BROOKES (Ed.). North-Holland, Amsterdam (1986). xii + 247 pp., \$56.00, ISBN 0-444-70050-1. (Distributed in the USA by Elsevier Science Publishers, New York.)

It is fitting that a multiple-authored book, such as these proceedings, should be reviewed in a multiple-authored commentary. The book presents a collection of ideas rather than the results of research. It starts without an introduction. In the two-page summary of the concluding discussion, Brookes states that the meeting reflected a clash between the pragmatic Nordic and the more imaginative Latin temperaments, and he regrets the lack of time to consider the implications of Garsetti's thesis that the close coupling of human with machine intelligence offers a direct method of exploring the still secret processes of human thought.

The first chapter, "On the Value of Information from the Information User's Point of View," by A. Repo is of questionable value. It quotes Wittgenstein's "*Worüber man nicht sprechen kann, darüber muss man schweigen*," as if to imply that we cannot speak about the value of information and therefore, it should not be talked about. Why, then, was the paper written, or even requested? It does fill 10 pages, with a very incomplete sketch of the background. For example, on information economics, no mention is made of the seminal contributions by Stiglitz, Marschak, Machlup, and Lambertson. It speaks, instead, of "frameworks"; lists research areas, characteristics of infor-

mation, kinds of knowledge, and recent studies and surveys; and concludes that clearer, more modest, more specific goals are needed for future research.

The chapter by M. E. D. Koenig, "Stage III of Information Systems Technology," introduces a stage model of information systems technology development. The first stage in the model is characterized by explosive growth in computational capability. Cheaper storage capability is considered as the most important reason for the transition to the second stage. We are now just commencing the transition to Stage III with the exponential growth of telecommunication capability. Adding to the descriptive stage model, he predicts that voice input capability will result in a dramatic increase in the use of information systems and will characterize a fourth stage. The choice of three fundamental variables in his stage model seems valid despite the existence of interrelatedness among the variables. However, will a fourth variable—voice input capability—really be the most important capability in the next stage?

The chapter by W. J. Martin, "Some Thought on the Information Economy," contributes an assessment of the British economy with emphasis on its emerging information sector. It concludes that such a sector will "best serve as illustrative rather than tangible or quantitative phenomena."

K. Jarvelin, in "Estimation of Query Cardinalities in Numeric Databases," proposes a query cardinality estimation model for numeric relational data bases. File characteristics are maintained as meta data and updated as each query is processed. The model asserts that functional dependence between attributes could work as a clue in estimating characteristics of a new file created by a query. The employment of the same data model for data base and meta data base eases the maintenance of file characteristics.

The chapter by S. Friis, "Tools for User Prototyping," introduces user prototyping by focusing on the communication between users and designers. The contents rely on the author's experience with "ENABLE" and "ENFORM," which is a data base loader and a nonprocedural query language, respectively. The lack of information on the relevance of the topic with the book title and references for prototyping diminished the value of this chapter.

The chapter by G. L. Dalenoort, "Solving Problems with the Help of Machines," emphasizes the importance of the role of internal presentations (mental models) for problem-solving activities of intelligent machines, as well as of humans. The relatively small capacity of human short-term memory is an important factor in the type of internal representation for efficient problem solving. His arguments are explained further with an example of an easy-to-understand program. Intentional as well as causal representation models of what we are programming are important for the construction of better programs that can be easily understood.

M. Bates, in "An Exploratory Paradigm for Online Information Retrieval," argues for a needed new paradigm that promotes and aids exploration for information. It is applied to online catalogs and online data base searching.

A. S. Pollitt, in "Expert Systems and the Information Intermediary: Tackling Some of the Problems of Naive End-user Search Specification and Formulation," presents an expert systems approach to document retrieval. An intelligent intermediary program provides specification of queries through an abstraction of a search space, and it generates a search statement on behalf of the user. This rule-based Prolog program shows reasonably high-quality search results by using knowledge of the subject matter of the search and of controlled vocabulary indexing.

J. J. Brittain, in "The Challenge of Information Technologies to Knowledge Creation in the Social Sciences," suggests exploring the use of expert systems to diagnose the information requirements of social scientists searching the literature, for example, or asking colleagues for leads, and to aid in the induction of rules from examples. The first suggestion should be seriously considered, perhaps following the approach started by Mavor, Kidd, and Vaughan, of representing what searchers know in terms of frames, and the procedures, in terms of scripts. The second suggestion requires basic studies of inductive inference, and the use of social science as a vehicle is probably not as good as the simple sequences found in the studies of Polya, Kochen, Solomonoff, or Simon.

M. M. Heine came up with a reasonably sound idea of studying knowledge transmission through a data base in his chapter, "Two Experiments on the Communication of Knowledge Through Databases." The study explores the other side of data base manipulation, that is, the matching between a designer's (communicator's) view and a user's (communicatee's) view. Unfortunately, most of the chapter is spent on experimental data analysis and individual differences as a communicator and/or a communicatee. The role of coded data in knowledge transmission has yet to be explored in a more general and theoretical way.

The chapter by H. M. Brooks, "Developing and Representing Problem Descriptions," introduces a model that describes the problems of the users who come to find relevant documents. Creating such a model is a prerequisite for an intelligent intermediary system to allow an end-user to directly access document retrieval systems. Semantic nets is suggested as a representation method for the user's

knowledge because of their high degree of diversity and descriptiveness. However, frames, as implemented in many knowledge-based systems, have the advantage of modularity and can be considered as an alternative representation method.

The chapter by P. J. Daniels, "The User Modelling Function of an Intelligent Interface for Document Retrieval Systems," introduces an expert system that simulates the intermediary in document retrieval. The knowledge about a user is maintained on a system blackboard and is accessed by independent subfunctions, which deal with specific features of a user's access to the information retrieval system. Expert systems are still at the stage of experimentation, and the appropriateness of a system scheme is yet to be evaluated by the operational performance of the system. In this sense, any evaluation of the idea suggested in this chapter must be postponed until implementation of the system.

B. Michelet and W. Turner argue for providing users with tools that help formulate information retrieval strategies rather than building a machine that translates user's interests into appropriate strategies for document retrieval. This approach looks similar to that of fourth-generation language or prototyping tools for application development and seems to shed some light on building a good document retrieval system. The system is named co-word search system and supports theme display and context dictionary. The appropriateness of the co-word search system as a search strategy building tool has yet to be tested by hard data and user acceptance in a real world.

The chapter by G. Sandstrom, "Augmented Thesaurus for Multi-Contextual Descriptions," presents a method to customize computerized systems for individual users. As tested by Furnas et al. (1983), users assign different meanings to the same objects. Augmenting the thesaurus based on a user's interrogation with the information system and keeping track of routines seem to improve the user's performance with the system. The implementation of the idea, however, may entail many technical problems.

A. Carsetti, in "Natural Intelligence and Artificial Intelligence," argues that the close coupling of natural intelligence with artificial intelligence offers a synergetic evolution of natural intelligence. Natural intelligence cannot develop all its potentialities, once a certain complexity level has been reached, without the use of the inner growth of the mirror represented by the artificial model. To be a real mirror, the artificial model should show itself to be increasingly autonomous and closer to the biological roots of the natural intelligence.

In the last chapter, "Summary of the Concluding Discussion," three members' comments on their personal reactions to the forum are summarized. M. Bates presents a contingent approach to the development of information systems. Her directions for this development are contingent on the perspective of the relationship between humans and information systems—sophisticated information system for the user or the user's adaptation to the information system? Y. le Coadic points out the necessity to rethink the concepts of such words as *information*, *information systems*, and *information society*. M. Carnevale emphasizes the need to take note not only of the human versus technology issue but also of the methodological versus operational issue.

On the whole, the book exhibits little evidence of an editorial hand or cohesiveness, but individual pieces could provide stimulation for research. The title is appropriate, and the index is adequate. It serves the purpose of reporting proceedings of yet another forum, but the literature would not have been any worse off without this book.

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Access to Academic Networks. P. J. HOLLIGAN. Taylor Graham, London (1986). 91 pp., £15.00, (\$26.50), ISBN 0-947568-08-5.

With a title like *Access to Academic Networks* one would expect either a thorough treatment of the issues related to network access or an in-depth treatment of the impact or implications of one or several of the issues. This book does neither.

The "Introduction" would lead one to assume that this is a report of survey data on uses and problems in network access. While the book does report some limited survey information, it tends to focus on peripheral matters, dealing primarily with networks used by academicians in British institutions. The book covers a broad spectrum of issues related to information networks, from a bit of the history of their development to the variety of the types of protocols and the ensuing problems to a survey of network uses in ten centers at British institutions. Covering a lot of territory, the book, unfortunately, does not do justice to any one area. For example, at times the book treats the reader as a novice, and at other time it treats the reader as an expert. Chapter 1, "What Is a Computer Net-