

description languages and relational data-bases are covered in this section. Section three is concerned with data base design and grouping data items into structures.

Part II discusses the physical organization of a data-base management system and presents many of the techniques necessary for implementing one. A general discussion of the physical organization and the differences between the physical and logical organization is included. Also included is a section on locating records which provides a general discussion of addressing techniques and covers indexed sequential organization and hashing in some detail. The discussion of alternate key-to-address methods in the chapter on hashing is simple but effective. The physical representation of logical structures is covered with a chapter on pointers and a discussion of methods of representing the associations between data (i.e. chains and ring structures and the physical representation of tree and plex structures). The retrieval of information using multiple keys is covered with a chapter comparing multiple-key organizations and chapters on the separation of data and relationships and on index organization. Other topics covered include index structures, data compaction, volatile files and fast response systems.

This text is one of the best I've seen on data-base organization. The presentation is clear and straight forward and the extensive use of figures and diagrams is excellent. The book makes a valuable contribution to the field of computer science and should certainly be read by any serious student of data-base design.

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WILLIAM H. JEPSON

The Purposive Brain. R. GRANIT, MIT Press, Cambridge, Mass. 1977, x, 244 pp. \$12.50. ISBN 0-262-07069-3.

The most complicated information system known to man, of course, is man himself. Ragnar Granit, Nobel Prize winning physiologist, provides often unique perspectives on this system, based on his long career of working both the "input" and "output" sides of brain functioning through study of the electroretinogram and control of movement.

The author's positive program of promoting "biological principles" is a counterpoint to the reductionist programs of biochemistry and biophysics. Such a principles approach has been at the foundation of several major theories of framework in general biology, according to Granit, e.g. for evolutionary theory, communications in bees, and the immune system. Peculiar biological knowledge is reduced primarily through asking provocative questions, the most provocative being "Why"?

For brain scientists, the approach allows no retreat from questions of purpose, teleology and consciousness. The scientific validity of this method, like others, is seen to lie primarily in its utility for solving important problems, e.g. in medicine, as was the case with immunology. A totally open-minded attitude is needed to be able to ask the unaskable, and it may be salutary, he says, to admit from the outset that certain information about the nervous system will not be attainable in our lifetime, or possibly ever.

The author's special resource in making a start on this program derives from the incentives his work has placed on deciphering input-output coordination mechanisms. His perusal of biological findings, e.g. on single motor neuron cell physiology, nerve fiber and synapse biochemistry, and cell complex physiology provides many suggestions. He asserts a need for greater attention to (individual organism) adaptability as distinct from (species level) adaptation. Purpose is elucidated against a backdrop of rich constructions: "open genetic instructions", "depurposing" and "repurposing", and general "boundary conditions" on the nervous system. Both waste and economy are observed in the organism, and "balanced" solutions to (nervous system) problems may be effectuated through these and related mechanisms. Consciousness in man is seen as the maximally adaptive component in nervous system workings.

Despite the accentuation on integrative mechanisms, the author does not look to cybernetics or computer simulation for help. He uncovers a concern for "premature sterilization" and a fear of being too remote in these fields. He acknowledges the contributions that they have made to the vocabulary, and encourages a vague "systems analysis".

A perhaps somewhat unusual circumstance surrounds the writing of the book and this review of it. Both were largely done while author and reviewer were on leave at the National Institutes of Health in Bethesda, MD. This afforded the reviewer, as it had previously the author, the opportunity to discuss these ideas with scholars at these institutes. Though there was an expected reservation concerning a number of the aspects, others were considered to be archetypical of what is deemed mandatory to advance beyond certain conceptual and practical roadblocks to progress in the brain sciences.

The reader is expected to possess "more than a passing interest in the deeper issues of biology", but no special knowledge of neurophysiology. The reviewer would raise both these prerequisites at least somewhat, lest the reader be lost in the nuances. The book, therefore, is most likely to be welcomed by information scientists interested in the foundations of the field, especially those who keep an eye on happenings in the area of biological processing of information.

A complaint might be registered: the author makes heavy use of personification and analogy. These detract from the substance when they abort the precision of definition that need be achieved in seriously proffering potentially controversial fundamental principles.

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Annual Review of Information Science and Technology, Vol. 12. MARTHA E. WILLIAMS (Editor). Knowledge Industry Publications, Inc., White Plains, New York 1977. 361 pp. \$35.00

The volume contains nine reviews; the topics were selected to reflect the master plan for the series. Five of the chapters introduce new topics: Bibliometrics, Numeric Data Bases and Systems, European Information Networks, History and Foundations of Information Science, and Privacy. This assessment is divided into two sections, comments on the volume as a whole followed by a summary of each chapter.

The major shortcoming of this volume is that it suffers from a lack of continuity. New topics are, for the most part, clearly identified, and two sets of authors, Park, and Liston and Howder, take great care to position their reviews with regard to previous volumes. Most of the remaining chapters however, are not linked to their predecessor(s) making it difficult for the novice user to obtain a longitudinal view of these topics. Nonetheless, ARIST represents an important reference source which continues to deserve a place in personal and institutional information science collections.

In the chapter "Evaluation and Design of Bibliographic Data Bases," Stern reviews literature appearing since the end of 1975. The chapter emphasizes evaluation aspects from a European perspective and a large number of the references are to European literature. In terms of overall quality, this chapter is one of the weakest in the volume. For example, the most recent ARIST chapter on the subject (Volume 11) is cited; however, none of the proceedings reviews are explicitly referenced in the text. Further, the section on bibliometrics duplicates material covered in Chapter 2 of this volume and is not adequately tied to evaluation. Finally, the author selects a set of articles "for the value of their experimental designs" which are then discussed only in terms of their findings.

Narin and Moll's chapter on "Bibliometrics" combines a tutorial on bibliometric techniques with a review of the literature. The authors' decision to limit their coverage to "readily available material in the open literature" excluded Parker's 1967 study of the behavioral sciences which was only published as a technical report (PB 177 073). Otherwise, the authors succeeded in representing the major authors who have published in this field and their chapter provides a sound introduction to the methodology and application of this important theoretical area.

Three main concerns are addressed by Park's chapter on "Bibliographic and Information Processing Standards"; they include universal bibliographic control, standards of machine readable records for interchange among abstracting and indexing services, and the standardization of individual data elements. The review attempts "to report national and international standards (official and *de facto*) which have been developed during the past two years" and to describe current activities which have been reported in published or widely available unpublished literature. The author notes that a "comprehensive framework for standards development appears to be lacking".

Liston and Howder's chapter on "Subject Analysis" reviews literature published primarily during 1976 which is related to the process of subject analysis, indexing and vocabulary management. They conclude that future research will be enhanced by integrating "the applicable knowledge being generated in a wide variety of disciplines". What distinguishes this review from its predecessors is the framework that the authors have developed to provide an overview for their review. Articles are assigned to cells in a matrix where rows represent processes such as "Indexing Methodologies" and columns represent aspects of the processes such as "Mechanization". As a result, the most popular topics based on publication volume are easily identified. Finally, the authors use the matrix to develop a subject index to their bibliography, thereby facilitating access to the references independent of reading the entire chapter. This chapter is enhanced by the additional analysis which might well serve as a model for future reviews.

The chapter on "Numeric Data Bases and Systems" by Luedke, Kovacs and Fried provides a good introduction to a topic which is gaining importance. The review begins with a discussion of the characteristics and uses of numeric data. Next, the authors survey existing data bases by subject and review and literature related to both costs and obstacles to use. An extensive list of acronyms is included.

Bunch and Alsber's chapter is primarily a tutorial addressing four main aspects of "Computer Communication Networks": network configurations, performance issues, common carrier communication utilities and packet switching. All four issues should interest both designers and users of network services. Unfortunately, there is substantial overlap in general subject coverage and the age of the literature covered by this chapter and its immediate predecessor in Volume 10 which these authors neither acknowledge in the text nor cite.