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Theoretical Foundations of Programming Methodology—Manfred Broy and Gunther Schmidt, eds. (D. Reidel Publishing, Holland, 1982, 652 pp., $39.50)

This book is for computer scientists who acknowledge the importance of theory. It contains an excellent collection of 18 papers based for the most part on the NATO Summer School lectures at Marktoberdorf in 1981. Since the book is part of the NATO Advanced Study Institute Series, one might have expected a lower price so that the ideas could be widely disseminated. However, the quality of much of the material makes the book well worth buying even at the price.

All the contributions were stimulating, however, because of space limitations, I am confining my review to a number of particularly interesting papers.

The paper by Burstall and Goguen, “Algebras, Theories and Freeness: An Introduction for Computer Scientists,” should be required reading for anyone interested in abstract data types. It is an admirably readable and authoritative guide to the terminology used in algebraic presentations of data types. The companion paper by Wirsing and Broy also aims to review approaches (e.g., initial versus terminal), but is somewhat harder to read. Denotational semantics is covered by papers from Scott (who was unable to attend the school) and Stoy. Scott’s paper describes a new, neighborhood approach to the foundations of recursive and self-referential functions. The 148 pages, while not easy to read, present the topic in a teachable way. Pending the promised textbook, this material is the most useful course information since Stoy’s book. Stoy’s paper gives a carefully motivated review of some of the techniques of language definition, such as continuations.

Much of the work on reasoning about parallelism is now attempting to use some form of modal logic. The paper by Manna, “Verification of Sequential Programs: Temporal Axiomatization,” provides an invaluable reference to the forms of reasoning that can be used. The results are not, I believe, entirely convincing, but until simpler methods are found, a logic that copes with time by operators is worth reviewing. Seven other papers on program development and verification cover both axioms themselves and the use of formal methods in the development of interesting programs.

The papers in the parts of the book on infinite structures and concurrent programs appear to be of more use to the specialist than to a general reader. Their titles include “Fundamental Properties of Infinite Trees,” by B. Courcelle; “Behaviors of Processes and Synchronized Systems of Processes,” by M. Nivat; “A Tutorial on the Split Binary Semaphore,” by E. W. Dijkstra; and “Discrete Event Simulation Based on Communicating Sequential Processes,” by W. H. H. Kaushik and C. A. R. Hoare.

As an incidental feature, the book contains sheet music that is intended to characterize the authors, and I recommend that those who do not read music have someone play it for them.

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Developing a Data Dictionary System—
J. Van Duyn, (Prentice-Hall, Englewood Cliffs, N.J., 1982, 204 pp., $25.00)

This slim volume is actually slimmer than its page count suggests. The pages are 9" × 5.5" with substantial spacing and indenting, and the book really has only 82 pages of text. The remainder consists of professional applications (i.e., selected real-world examples) and tables. Of the 11 chapters, only two exceed 10 pages of text and four have five or fewer pages. With judicious skimming a reader can easily absorb the main ideas of the book in a few hours.

Fortunately, the book’s small size does not translate into a superficial treatment of the topic. Van Duyn describes the motivation for data dictionary systems, their principal elements, and most important, major considerations for a potential user. In this well-thought-out presentation, he takes the view—and quite correctly, I believe—that the details of a DDS implementation are too application and environment specific to be dealt with meaningfully in a general manner. Consequently, in his text, he deals only with concepts, not details, and uses well-chosen sample applications to illustrate the details necessary for a specific application. Given this intention, the book is well organized and largely successful. The only real deficiencies I see are its reliance on commercial data processing for all sample applications, the minor treatment of DDS use in supporting the analysis and design phases, and the omission of issues pertaining to distributed databases. Nonetheless, the book is oriented towards aspects of DDSs that most interest the general user community.

The 11 chapters can be broken into a logical progression of five units. Van Duyn begins by presenting fundamental information that most computer professionals will view as extraneous, although some distinctions between file and database systems may be worth reviewing. Chapters 3 through 5 describe a DDS and present its rationale. I found elements of “oversell” in these chapters, including a tendency to list numerous benefits without much indication of how they are to be achieved. However, most of the “how” is dealt with in Chapters 6 through 8, the heart of the book, which describe the building of a DDS and the manner in which one should go about it.

Chapters 8 through 10 describe the use of a DDS in a system environment, including its use during the operational/maintenance phase. The last chapter discusses commercial DDS products, relevant selection criteria, and questions that should be asked. It concludes with 10 pages of tables that provide a handy comparison of 34 aspects of seven commercial DDS products.

The book is easy to read, well edited (I noted only one misspelling), self-contained, and meaningful to those with a broad range of computer backgrounds. I do not think it is suitable as a textbook, but it can certainly be of value to computer professionals for self-instruction, for refresher instruction, or as initial reference material on the subject. A good bibliography is provided for those who need more detail, and both the table of contents and the chapter subheadings (but not always the chapter titles themselves) are well chosen to permit the rapid location of specific information.

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