Book Reviews

The Art of Computer Programming, Volume 1. By Donald E. Knuth. Addison-Wesley Publishing Company, Reading, Mass. (1968). 634 pp. $19.50.

For the past several years books on computer programming have flooded the technical market. The typical book on computer programming is an introduction, which includes some incomplete and inaccurate statements about the history of computing, a chapter on motivation, a description of a computer, and an elementary introduction to programming. These books are largely "user's manuals" with hard covers, and thousands of computer programmers could write one.

Knuth's work is a significant contribution to the creation of a professional base for computer programming. *The Art of Computer Programming* is the title of a seven-volume set of books, to have the following titles: Volume 1, *Fundamental Algorithms;* Volume 2, *Seminumerical Algorithms;* Volume 3, *Sorting and Searching;* Volume 4, *Combinatorial Algorithms;* Volume 5, *Syntactic Algorithms;* Volume 6, *Mathematical Linguistics;* Volume 7, *Compilers.*

While it is clear from these titles that the author has professional programmers in mind as his primary audience, it is also clear from the contents of the first volume in the series that no one who takes programming seriously can afford to miss becoming acquainted in some detail with Knuth's work. Although much of the material presented will be new to most programmers, this is not an introduction to programming in the usual sense. Rather, it is intended for readers who are experienced in programming, readers who want and need to advance their professional capabilities. The exceptional quality of this book will asure its wide use as a text in programming classes.

The first volume contains just two chapters: "Basic Concepts" and "Information Structures." The chapter on basic concepts covers algorithms, some mathematical preliminaries, a description of a computer (MIX) designed especially for this study, and basic programming techniques. The chapter on information structures covers linear lists, trees, multilinked structures, and dynamic storage allocation. Knuth writes with a lucid style and he is careful to present the historical and bibliographic background for his material, which lends interest and perspective. There are over 800 exercises, which are a major part of the material, and the answers to these exercises alone comprise 141 out of a total of 634 pages. The exercises are graded by time for solution and mathematical difficulty, varying from those which the reader should be able to answer immediately if he has understood the text, to the research problem which has not yet been solved satisfactorily. The exercises are unusual in that the author has obviously spent as much or more time on them as he has on the text; this is a pleasant contrast to many books in which the exercises seem to be appended as a hasty afterthought. The only typographical error this reviewer found occurs on page 122, where the second index register is referred to as "1I2" rather than its correct designation, "rI2."

The use of the MIX machine language rather than some currently available language implies the need to program a MIX simulator for executing the programs specified in the exercises. While the value of the book is not wholly dependent upon the availability of a MIX simulator, its value would certainly be enhanced thereby, and some readers may hesitate to spend $19.50 on a book whose contents are not fully available to them.

Finally, Knuth is one of the all-too-rare writers of serious technical works who is unafraid to spice his work with humor. For example he introduces the history and bibliography of the information structure called "trees" with the following: "Trees have of course been in existence since the third day of creation and perhaps earlier, and through the ages tree structures (especially family trees) have been in common use." The last numbered page contains the explanation, "Any inaccuracies in this index may be explained by the fact that it has been prepared with the help of a computer . . . ."

If succeeding volumes in this series are equal in quality to the first one, this may well be the definitive work on computer programming which has been needed so badly and which has been so long in coming.

William J. Worlton
Los Alamos Scientific Laboratory
Los Alamos, New Mexico 87544

July 5, 1968

About the Reviewer: Mr. Worlton is a coordinator of automatic data processing at the Los Alamos Scientific Laboratory where he has been a staff member since graduate studies at Utah State University. His interests are in the history of computing, computer architecture, and the evaluation and comparison of computer systems.

Plutonium Handbook, Volume I. O. J. Wick, Ed. Gordon and Breach, Science Publishers, New York (1967). 520 pp. $15.50 (professional ed.). $26.00 (reference ed.).

Since its discovery in 1941, plutonium has evolved from a laboratory curiosity to a major factor in the nuclear future of the world—both as a weapon material and as a major source of energy for electric power generation. The amount of activity in research, development, and engineering concerning plutonium and its applications has been expanding at an enormous rate over the past two decades. These efforts have led to a widely diversified literature concerning this material, and *Plutonium Handbook* has been prepared to collect the pertinent information into one source reference. According to the Editor, "The *Plutonium Handbook* is written to provide information on the broad