material should be comprehensible and useful to anyone with a few years of college mathematics.

P. J. D.

59[X].—B. R. SETH (executive editor), *Proceedings of the Seventh Congress on Theoretical and Applied Mechanics*, Indian Society of Theoretical and Applied Mechanics, Kharagpur, India, 1961, xi + 379 p., 25 cm.

Of the papers presented, that which offers the main interest for computation is "Monotonic operating in numerical mathematics," by L. Collatz, a survey of part of the recent work done by the author and his school, and published mainly in the *Archive for Rational Mechanics and Analysis* and in *Numerische Mathematik*.

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60[Z].—FRITZ RUDOLF GÜNTSCH, *Programmierung digitaler Rechenautomaten*, Walter de Gruyter & Co., Berlin, 1963, 392 p., 24 cm. Price $13.00.

According to the introduction, this second edition represents a completely changed and substantially expanded version of the work; and, without question, this is indeed a rather modern introduction to the programming field.

A striking feature of this book is the complete parallelism of presenting the entire material in a symbolic machine-oriented language and at the same time in an algorithmic language. Throughout its entire design and terminology the presentation in algorithmic notation has been directed completely and consistently toward ALGOL, and accordingly the book is in part an elementary introduction to ALGOL-60. The symbolic programming is based on the Zuse Z-22. The Z-22, a widely used computer in German universities, has a 2^{12}, 38-bit word drum memory with 5 ms mean access time and a 16-word core memory, which is in part used as accumulator and for various registers. The symbolic notation employed is based on the Freiburger Code, an assembly language developed at the University of Freiburg/Br.

Chapter 1 provides an introduction to flow charts and programming in general, after which it presents a brief description of the Z-22. The second chapter gives a concise definition of the Z-22 order code and a convention for flow chart notations. Chapter 3, the longest chapter in the book, enters into a detailed discussion of simple programs, including the concept of a loop; at the same time the fundamentals of ALGOL are introduced (although the name ALGOL is not yet mentioned). This is followed by a short Chapter 4 on symbolic addressing, while Chapter 5 deals with programs with multiply nested loops. Chapter 6 then discusses the different ways of supplying a subroutine with parameters and includes a very good, brief discussion of recursive subroutines. Chapter 7 contains a systematic presentation of address changes, relocation of programs, indexing and related topics. Chapter 8 introduces the succeeding chapters by discussing briefly the differences between interpretive routines and assembly programs, etc. Chapter 9 then furnishes a presentation of the actual machine language of the Z-22 and of some of the principles of assembly programs as, for example, address assignment and subroutine calls. Chapter 10 concerns itself with compiler languages and with some aspects of

formula translation; in particular, Rutishauser's and Bauer and Samelson's work is briefly discussed, with very little reference to relevant developments in the U. S. A. This is followed by a very general section on language unification. As mentioned earlier, starting with Chapter 3 the author has built up and used an algorithmic language based on ALGOL. Chapter 11 now gives a precise definition and summary of ALGOL-60, using Backus' notation. The final Chapter 12 is entitled "parallel programming" and gives a survey of various aspects of this field, including such topics as input/output buffering and program interrupts, and including a fairly representative citation of basic references.

Many programming examples are used in every chapter to elucidate the discussion. Each example stresses the parallelism of the language presentation and consists of a general problem statement, a detailed flow chart, a full Z-22 symbolic program as well as an ALGOL program. The examples are taken in part from numerical analysis, but there are also a large number of problems from various areas of business data processing.

The book is written in a lucid style and makes very good reading. The overall presentation shows the commitment of the German computing community to ALGOL. At the same time, a significant feature of the book is its complete lack of material on programming and monitoring systems, the use of tapes or disks, and similar problems of importance to users of large-scale computing systems.

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EDITORIAL NOTE: The first edition, entitled *Einführung in die Programmierung digitaler Rechenautomaten*, was reviewed in *Math. Comp.*, v. 15, 1961, p. 316.

61[Z].—WALTER HOFFMANN, Editor, *Digital Information Processors*, John Wiley & Sons, Inc., New York, 1962, xxi + 740 p., 23 cm. Price $27.00.

This is a most welcome volume to everybody in the computer field who cares to know what happens outside of his own particular area of computer applications. In the words of the editor, "it is addressed primarily to those readers already familiar with computers, and the computing specialists, who, for example, wish to learn about their neighboring areas or about new trends which have not yet become common knowledge".

Each of the 25 contributors had complete freedom as far as the presentation of their subject and the expression of their opinions was concerned. Eight contributions are in German, seven are in English, and each is preceded by English, French, and German summaries.

The first article by Heinz Zemanek on automata and thought processes is a critical study on the nature of automation. He analyzes automata and thought processes from the point of view of one skilled in the automation engineering art. Then he summarizes and critically reviews published work. He goes on to single out the basic processes of reproduction, reduction, and expansion of information and describes the famous "artificial animals". Specific problems such as learning, composing, game-playing, and problem solving by machine are discussed. The paper ends on a philosophical note: "Is there an end to the natural sciences?"