The second, "Some results of research on automatic programming in eastern Europe," by Wladyslaw Turski, is also very interesting, though at times it is a bit cryptic.

The third and longest (127 pp.), "A discussion of artificial intelligence and self-organization," by Gordon Pask, reveals that the field has developed its own literature (204 references), jargon, and conventions which the outsider (this reviewer) finds incomprehensible. Thus, "Since we are considering the real world, a computing machine is *not* a typical localized automaton. It has an aura of permanence which belies the fact that any localized automaton, open to the structural perturbations of the real world, has a finite life span. A better exemplar, perhaps, is an ape in a cage." That one should draw such distinctions, and continue to discuss them for some pages, makes the outsider wonder at the level of science being done.

The fourth article, "Automatic optical design," by Orestes N. Stravroudis, gives a good deal of information about one of the earliest applications of digital computers and presents both the history and the current state in a manner that is quite readable to anyone who knows some physical optics.

The fifth article, "Computing problems and methods in X-ray crystallography," by Charles L. Coulter, also treats a classic application in a manner that is reasonably clear.

The sixth, "Digital computers in nuclear reactor design," by Elizabeth Cuthill, being a topic of vast dimensions, tends at times to degenerate into listings of these and those codes, but is useful to the beginner (and perhaps the expert) in the field (386 references).

The last, "An introduction to procedure-oriented languages," by Harry D. Huskey, is a short article (28 pp.). It is interesting, and at least this reader wished that the author had taken more time and space on this important topic.

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103[Z].—DONALD I. CUTLER, *Introduction to Computer Programming*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1964, viii + 216 pp., 24 cm. Price $9.35.

This book is intended to be a primer of basic programming concepts and is directed toward readers with no previous knowledge of computers and with a mathematical background of high school algebra. The presentation is based on a simple hypothetical binary computer called the EX-1, and the material is very standard and by nature similar to that of various other texts of this type. The first two-thirds of the work cover the rudiments of number representation, data representation in machines, flow diagramming, and programming the EX-1 in a simple assembly language, using both fixed- and floating-point arithmetic. Topics discussed include indexing, symbol tables and table-lookup, elements of sorting, and the subroutine concept. Also included are chapters on input-output and on scaling techniques for fixed-point arithmetic. In its final third section, the book enters into a somewhat vague descriptive presentation of "modern" topics. This begins with a cursory discussion of a "typical modern giant computer" and continues with the introduction of a compiler language called TRIVIAL. In both cases the presentation is extremely hurried and would undoubtedly be quite unsatisfactory for a novice reader.

Although the presentation in general reads easily and is aided by many illustrations, the author has a very unfortunate habit of mentioning briefly important concepts in the form of a single sentence or a paragraph, without ever trying to explain these remarks further—a habit which leaves the reader with many questions unanswered. Altogether, the text is certainly only a very elementary primer, which could serve at best as a first introduction to the field of programming. However, it may well find some appreciative readers among high-school students and others interested in learning something about computers and the problems of programming for them.

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104[Z].—CHARLOTTE FROESE, *Introduction to Programming the IBM* 1620, Addison-Wesley Publishing Company, Inc., Reading, Mass., 1964, vii + 72 pp., 28 cm. Price $2.50.

This is a short and elegant programming manual for the IBM 1620 Model I with the automatic-division feature, indirect addressing, and either paper tape or card input-output. The last of the seven chapters in this book outlines the features of the discpack. The first six chapters cover the 1620 central processor, principles of programming, input/output, and the Symbolic Programming System (SPS). The author is to be commended for a clear and particularly well-organized presentation and for having managed to include so many basic programming concepts in a manual devoted to a particular machine. Her explanations of symbolic addressing, macros, monitor systems, subroutines, iterative procedures and recursive techniques, though elementary, are remarkably lucid and to the point. They make this soft-covered little book much more than its title suggests.

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105[Z].—GERALD A. MALEY & EDWARD J. SKIKO, *Modern Digital Computers*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1964, xiv + 216 pp., 23 cm. Price $10.00.

This book is intended as an introductory text to the field of digital computers. It is composed of ten chapters, whose contents range from a discussion of the binary number system to a discussion of various features of advanced computers such as "instruction look-ahead." The greater part of the book is devoted to engineering details of large digital system. Specific computers, the IBM 7090–94 and 7080 systems, are described and used as models of scientific and business computers, respectively.

Because the authors believe that "a complete comprehension of computers cannot be obtained without a basic understanding of programming," they have included two chapters on "Fundamentals of Programming" and the "Fortran System." The reviewer cannot agree that "these chapters are substantial and will enable the reader to write working programs." The latter chapter is abstracted from the IBM 7090 Fortran manual and does not add very much to the contents of that manual.