Some of the authors are concerned with preformal questions, i.e., with a discursive characterization of the substance of language; Quine, Putnam, Chao, Herzberger, and Jakobson seem to have such interests. Others are fully engaged with the construction of formal systems: Chomsky, Hiż, Curry, Halle, Abernathy, Peterson and Harary, Lambek, Mandelbrot, and Wells. Oettinger, Yngve, and Hockett aim at description of linguistic processors—natural or artificial—rather than at characterizations of language, although all three have formalisms to display. Eden, working on handwriting, might be placed with one of the latter two groups. Goodman's contribution is the exposition of a branch of mathematics in its potential application to linguistic theory. Gleason shows the application of classification theory to a major branch of linguistics, the tracing of historical connections among languages.

A cursory inspection of this volume would suggest that the "structure of language" is just its grammatical—or, more narrowly, syntactic—structure. Mandelbrot objects to the identification of "linguistics" and "grammar" (pp. 211–214), but mathematical formalization of linguistic theory is going forward more rapidly in syntax than in any other area, and it is, as Jakobson remarks (p. vi), mathematical logic and the theory of recursive functions in particular that is being applied. Mandelbrot seems to agree with his opponents that "statistical" and "grammatical" models are "contradictory." He supposes that they must remain so; a different possibility is that grammatical models will furnish a structure on which statistical models can be developed. Grammar in any case is not the whole of linguistics, and problems like Gleason's will probably be brought to computing centers more often in the future.

Computational linguistics has been hampered by lack of sufficient and sufficiently sound publications in mathematical linguistics; this volume should be studied by any linguist or mathematician who proposes to program syntactic operations, whether for research purposes or in connection with such applications as machine translation.

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25 [Z].—DONALD P. ECKMAN, Editor, *Systems: Research & Design*, John Wiley & Sons, Inc., New York, 1961, xiii + 310 p., 23 cm. Price $8.50.

This book is the Proceedings of the First Systems Symposium at Case Institute of Technology. It contains a Foreword, a Preface, and fourteen papers concerning systems research and systems design. The fourteen papers vary in style, most noticeably with regard to bibliographic reference. Some are simply advice from the author without reference to other work, others have extensive bibliographies. Only one pertains directly to the mathematics of computation, "A problem in the design of large-scale digital computer systems" by R. J. Nelson. This paper is devoted almost entirely to the problem of designing a machine which would be efficient in selecting the largest number of a set and (by implication) in other sorting problems. No specific design is arrived at, but a facility for scanning a region of the memory is suggested; the ideas may mislead some readers if they are unfamiliar with threshold search commands such as that of the Control Data Corporation 1604 computer and with the engineering details of comparison circuits.

Other papers have implications connected with the mathematics of computation, as would be expected in any current book on large systems. Thus in the Foreword, Simon Ramo remarks that "it could be said that systems engineering in today's sense became possible only with the introduction of the large digital computer." However, the papers in this volume contribute few direct suggestions concerning this use, and concern themselves largely with other general and specific aspects of systems engineering.

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26 [Z].—DANIEL D. MCCRACKEN, *A Guide to FORTRAN Programming*, John Wiley & Sons, Inc., New York, 1961, viii + 88 p., 28 cm. Price $2.95.

The usefulness of Fortran as an automatic programming system available on many different computers has prompted Dr. McCracken to publish this guide. It is addressed to people who have no programming experience but have a requirement to accomplish scientific computation or wish to get some appreciation of how this can be done.

The guide is developed pedagogically, with numerous examples, and includes a set of detailed case studies which provide examples from several fields of effort. These case studies illustrate the essential features of Fortran and suggest the range of its applicability.

An appendix summarizes the characteristics of a number of Fortran systems that have been established for different computers.

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27 [Z].—FRANCIS J. MURRAY, *Mathematical Machines*, Vol. 1 and 2, Columbia University Press, New York, 1961. V. 1, vii + 300 p., 26 cm. Price $12.50. V. 2, vii + 365 p., 26 cm. Price $17.50.

Volume one of Professor Murray's two-volume work on mathematical machines, is concerned with digital computers. There are two parts in Volume 1: part I on desk calculators and punched card machines, and part II on automatic sequence digital calculators. These digital devices are presented in the order of increasing competence and complexity.

In part I, there are eight chapters. The first four chapters describe desk calculators, from the basic idea of register and counter to the description of many commercial automatic calculators. Chapter 5 covers electrical counters and accumulators. Punched card machines are presented in Chapters 6 and 7, and sequence calculators such as calculating punch and electronic calculator in Chapter 8.

Part II consists of ten chapters. The first four chapters describe the logic aspect of the computer as well as digital arithmetic. Chapter 5 is a general discussion on the use of Boolean analysis. Chapter 6 is concerned with circuit elements. The programming aspects are covered in Chapters 7, 8, and 9. Chapter 10 is a very brief survey of digital computers.