the notions of the domain and range of functions and operators in discussing programs and metaprograms.

Chapter 1, which deals with number systems, congruences, symbolic logic, and encoding, is followed by three chapters that treat manual, semiautomatic (punched card), and automatic equipment. It is clear that some knowledge of such devices is important to the computer user. It is, however, equally clear that a substantial portion of a college senior's two-semester course should not be devoted to these topics. For such a course, I would much prefer to use a textbook in which the space devoted to these topics is considerably decreased and the savings assigned instead to an elaboration of the topics treated in chapters 5, 6, 7, and 8.

The authors have chosen to devote a good portion of chapters 4 and 5 to the obsolescent IBM-650 computer and to use this as a hypothetical machine in the subsequent discussions. I concur with the authors in their advocacy of the use of an actual computer in discussing computer coding and computer organization. I cannot, however, agree that the IBM-650 is a "not atypical" computer nor do I feel that the existence of programs which simulate the IBM-650 on many modern computers is a justification for discussing the organization of the IBM-650.

The discussions of programming, searching and sorting, and metaprograms, in chapters 6, 7, and 8, respectively, constitute the best part of the book. These chapters contain many actual programs and are well written. The authors stress the fundamental ideas and illustrate them by cogent examples. Some of the material in these chapters is a selection and a simplification of the treatment given in Iverson's excellent research monograph *A Programming Language*, also published by Wiley.

It is most unfortunate that the authors did not replace the material on the IBM-650 by corresponding material on a nonobsolescent computer and that they devoted so much space to manual and punched card equipment. If these lapses had been corrected, the authors' goal would have been better achieved and they would have written an excellent, comprehensive introduction to the use of automatic computers in all aspects of data processing.

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Mathematics

Nonlinear Mathematics. Thomas L. Saaty and Joseph Bram. McGraw-Hill, New York, 1964. xvi + 381 pp. Illus. $12.50.

Four brief quotations from the preface will suggest the spirit and the flavor of this fine new book by Saaty and Bram.

"Nonlinear mathematics is the mathematics of the day. Modern science demands it. . . . This volume is intended for the teacher who feels a need to unify the prolific subject matter of nonlinear mathematics. . . . Besides mathematicians we have written this book with scientists, engineers, economists, operational analysts, and other interested readers in mind. . . . We have tried to give more than a compilation of known techniques, to convey a spirit. In this spirit we integrate different topics of mathematics to show their interactions, to stimulate inventiveness through variety and to emphasize their origins from interaction with natural phenomena in physics, engineering and economics."

The first two chapters recapitulate the well-established theory of linear and nonlinear transformations and develop basic methods for solving systems of nonlinear algebraic and transcendental equations. Then a beginning discussion of linear programming theory precedes an 80-page treatment of nonlinear optimization and nonlinear programming. The better-known algorithms available for the construction of solutions of linear and nonlinear optimization problems are treated extensively.

The latter half of the book deals with nonlinear ordinary differential equations, automatic control theory, and linear and nonlinear prediction theory. Perturbation methods, stability theory, periodic solutions, and, especially, Lyapunov's stability theory are presented. A brief summary of useful techniques for solving nonlinear equations is noteworthy. Problems of random disturbances in control and communication are treated on the basis of the rather recent successes in the field of random processes.

Omitted, by choice, are topics in nonlinear partial differential equations, nonlinear integral and difference equations, and the subject of numerical methods. The style is informally pedagogic and conversational. Proofs are minimized to allow more extensive interpretation, motivating illustrations, and discussion of background and rationale. The presentation of ideas follows an effective sequential pattern: uniqueness and existence results, characterization, construction of solutions, convergence, approximation, and errors.

Readers of *Science*, and many others, will find this book of special interest. It provides an orderly, motivated treatment of these important topics, aimed at the senior or early graduate level. The authors have succeeded admirably in presenting this material in a form suitable for reading or for use in teaching. Insight, applications, and interrelationships have been developed. The extensive bibliography will be especially helpful to nonspecialists.

Here, then, is a book that should appeal to mathematicians in academic departments and to mathematics practitioners.

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New Books

Biological and Medical Sciences

Actualités de Phytochimie Fondamentale. Charles Mentzer and Olga Fatianoff. Masson, Paris, 1964. 270 pp. Illus. F.85.

Ageing. The biology of senescence. Alex Comfort. Holt, Rinehart, and Winston, New York, ed. 2, 1964. 379 pp. Illus.

Biostatistics. An introductory text. Avram Goldstein. Macmillan, New York, 1964. 284 pp. Illus. $9.50.

British Ecological Society Jubilee Symposium Supplement. A symposium held at London in March 1963. A. MacFadyen and P. J. Newbould, Eds. Blackwell, Oxford, England, 1964. 248 pp. Illus. Paper, 50s. Nineteen papers on the history of ecology in Britain, ecology and conservation, Quaternary ecology, production ecology, experimental and autecological studies, and the community concept. The volume is published as a supplement to the *Journal of Ecology* (vol. 25) and the *Journal of Animal Ecology* (vol. 33).

The Cell. Biochemistry, physiology, morphology. vol. 6, *Supplementary Volume.* Jean Brachet and Alfred E. Mirsky, Eds. Academic Press, New York, 1964. 578 pp. Illus. $18. Six papers: "The protozoan nucleus," Karl G. Grell; "The cytoplasm of Protozoa," William Trager; "The fungi," John B. Raper and Karl Esser; "The plant cell: Aspects of its form and function," Bruce R. Voeller (with electron micrographs by Myron C. Ledbetter and Keith R. Porter); "Sensory cells," R. Cordier; and "Connective tissue cells," Sylvia Fitton Jackson.

Cell Differentiation. vol. 17, Symposium of the Society for Experimental Biology.

(*Continued on page 1384*)