

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.

A. H. TAUB

Computer Center,
University of California, Berkeley

12 JUNE 1964

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.

B. H. COLVIN

Boeing Scientific Research
Laboratories, Seattle, Washington

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)

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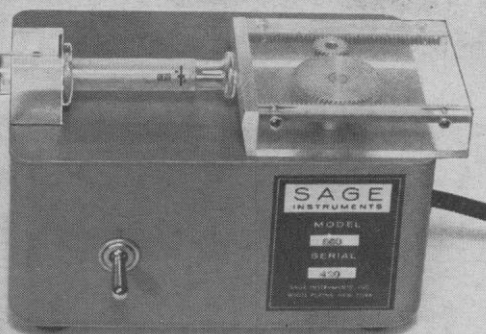
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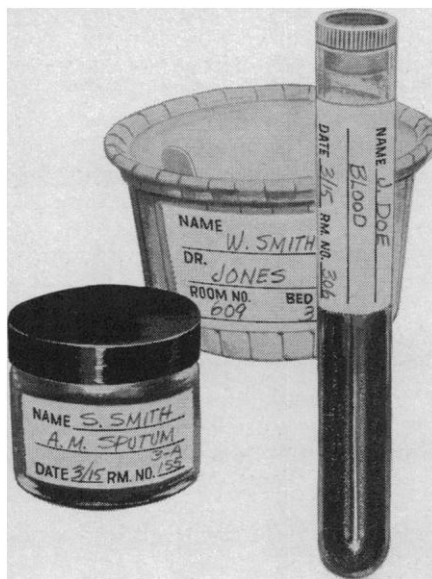
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NEW BOOKS

(Continued from page 1329)

G. E. Fogg, Ed. Published for the Company of Biologists by Academic Press, New York, 1963. 412 pp. Illus. \$14. The papers were presented at a symposium held in September 1962 at Edinburgh, Scotland.

The Cerebellum of the Cat. Structure and fibre connexions. J. Voogd. Davis, Philadelphia, 1964. 223 pp. Illus. \$20.

The Chemistry and Therapy of Disorders of Voluntary Muscles. E. G. Murphy; with an introductory chapter by G. R. Williams. Thomas, Springfield, Ill., 1964. 137 pp. Illus. \$6.50.

Clinical Chemistry. Principles and techniques. Richard J. Henry. Harper and Row, New York, 1964. 1152 pp. Illus. \$24.50.

Comprehensive Biochemistry. vol. 15, *Group-Transfer Reactions*. Marcel Florkin and Elmer H. Stotz, Eds. Elsevier, New York, 1964. 258 pp. Illus. \$12.50.

Cytologie de l'Adénohypophyse. An international colloquium (Paris), September 1963. Jacques Benoit and Christian Da Lage, Eds. Éditions du Centre National de la Recherche Scientifique, Paris, 1963. 448 pp. Illus. Plates. F.98.

Development: Selected Topics. Lucena Jaeger Barth. Addison-Wesley, Reading, Mass., 1964. 123 pp. Illus. Paper, \$1.75; cloth, \$2.95.

Diagnostic Procedures and Reagents. Technics for the laboratory diagnosis and control of the communicable diseases. Albert H. Harris and Marion B. Coleman, Eds. American Public Health Assoc., New York, ed. 4, 1963. 900 pp. Illus. \$15.

Elements of Cytology. Norman S. Cohn. Harcourt, Brace, and World, New York, 1964. 384 pp. Illus. \$8.95.

Experimental Chemotherapy. vol. 2, pt. 1, *Chemotherapy of Bacterial Infections*. R. J. Schnitzer and Frank Hawkins, Eds. Academic Press, New York, 1964. 632 pp. Illus. \$23.

Fermentdiagnostik Interner Erkrankungen. Diethard Amelung. Thieme, Stuttgart, 1964. 187 pp. Illus. Paper, DM. 29.70.

Fetal and Infant Liver Function and Structure. Annals of the New York Academy of Sciences, vol. 111, art. 1. Harold E. Whipple, Ed. The Academy, New York, 1963. 558 pp. Illus. Paper, \$7. Papers on morphology, physiology, chemistry, bilirubin and related compounds, pathology, and clinical problems. The series of papers resulted from a conference held in November 1962.

Genetical Principles and Plant Breeding. Watkin Williams. Davis, Philadelphia, 1964. 514 pp. Illus. \$12.75.

The Genetics of the Silkworm. Yataro Tazima. Logos Press, London; Prentice-Hall, Englewood Cliffs, N.J., 1964. 265 pp. Illus. \$9.95.

Handbook of Basic Microtechnique. Peter Gray. McGraw-Hill, New York, ed. 3, 1964. 316 pp. Illus. \$7.95.

International Review of Cytology. vol. 16. G. H. Bourne and J. F. Danielli, Eds. Academic Press, New York, 1964. 355 pp. Illus. \$14.

Jahresberichte des Naturwissenschaftlichen Vereins in Wuppertal. vol. 19,

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Probleme der Orchideengattung Ophrys. Hans Sundermann and Wolfgang Haber, Eds. Naturwissenschaftlichen Vereins, Wuppertal, Germany, 1964. 72 pp. Illus. Paper.

Laboratory Techniques in Botany. M. J. Purvis, D. C. Collier, and D. Walls. Butterworth, Washington, D.C., 1964. 379 pp. Illus. \$11.50.

Mammalian Protein Metabolism. vol. 1. H. N. Munro and J. B. Allison, Eds. Academic Press, New York, 1964. 582 pp. Illus. \$18.50.

Marine Bio-Acoustics. Proceedings of a symposium (Bimini, Bahama Islands) April 1963. William N. Tavolga, Ed. Pergamon, London; Macmillan, New York, 1964. 427 pp. Illus. \$15.

The Mechanics of Inheritance. Franklin W. Stahl. Prentice-Hall, Englewood Cliffs, N.J., 1964. 185 pp. Illus. \$4.95.

Microbes: Their Growth, Nutrition, and Interaction. Alfred S. Sussman. Heath, Boston, 1964. 134 pp. Illus. Paper.

Microbiological Methods. C. H. Collins. Butterworth, Washington, D.C., 1964. 340 pp. Illus. \$9.95.

Microbiology. Kenneth L. Burdon and Robert P. Williams. Macmillan, New York, ed. 5, 1964. 782 pp. Illus. \$7.50.

New and Nonofficial Drugs. Evaluated by the Council on Drugs of the American Medical Association. Lippincott, Philadelphia, 1964. 895 pp. Illus. \$4.

The Organ of Corti: Its Histophysiology and Histochemistry. Ya. A. Vinnikov and L. K. Titova. Translated from the Russian edition (Leningrad, 1961) by Basil Haigh. Consultants Bureau, New York, 1964. 273 pp. Illus. \$13.50.

Parenthood and Heredity. Sheldon C. Reed. Wiley, New York, ed. 2, 1964. 288 pp. Paper, \$1.65.

Perception and the Conditioned Reflex. Ye. N. Sokolov. Translated from the Russian edition (Moscow, 1958) by Stefan W. Waydenfeld. Pergamon, London; Macmillan, New York, 1963. 319 pp. Illus. \$12.

Photochemistry of Proteins and Nucleic Acids. A. D. McLaren and D. Shugar. Pergamon, London; Macmillan, New York, 1964. 461 pp. Illus. \$15.

Physiological Mammalogy. William V. Mayer and Richard G. Van Gelder, Eds. vol. 1, *Mammalian Populations*. John B. Calhoun and J. J. Christian. Academic Press, New York, 1963. 393 pp. Illus. \$12.

Physiological Problems in Space Exploration. James D. Hardy, Ed. Thomas, Springfield, Ill., 1964. 343 pp. Illus. \$12.50.

Physiology of Mollusca. vol. 1. Karl M. Wilbur and C. M. Yonge, Eds. Academic Press, New York, 1964. 487 pp. Illus. \$16.

The Plant Kingdom. Harold C. Bold. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1964. 128 pp. Illus. Paper, \$1.75; cloth, \$3.95.

The Principles and Practice of Agricultural Research. S. C. Salmon and A. A. Hanson. Hill, London, 1964. 396 pp. Illus. 75s.

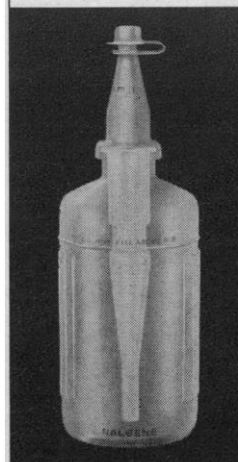
Principles of Biology. W. Gordon Whaley, Osmond P. Breland, Charles Heimsch, Austin Phelps, A. R. Schrank, and Orville Wyss. Harper and Row, New York, ed. 3, 1964. 796 pp. Illus. \$8.95.

Principles of Genetics. Eldon J. Gard-

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ner. Wiley, New York, ed. 2, 1964. 394 pp. Illus. \$8.

Progress in the Chemistry of Fats and Other Lipids. vol. 7, pt. 2. R. T. Holman, Ed. Pergamon, London; Macmillan, New York, 1964. 129 pp. Illus. Paper, \$5. Three papers: "Gas chromatography of lipids," E. C. Horning, A. Karmen, and G. C. Sweeley; "The coenzyme Q group (ubiquinones)," F. L. Crane; and "Antioxidant effects in biochemistry and physiology," J. G. Bieri.

Quantum Aspects of Polypeptides and Polynucleotides. A symposium (Stanford University), March 1963. M. Weissbluth, Ed. Interscience (Wiley), New York, 1964. 571 pp. Illus. \$22.50.

Radiation, Isotopes, and Bone. Franklin C. McLean and Ann M. Budy. Academic Press, New York, 1964. 230 pp. Illus. Paper, \$3.45; cloth, \$5.95.

Radioactive Metal Mobilization in Medicine. Alexander Catsch. Translated from the German by Bergene Kawin. Thomas, Springfield, Ill., 1964. 182 pp. Illus. \$7.50.

Recent Advances in Biological Psychiatry. vol. 6. Proceedings of the 18th annual convention and scientific program of the Society of Biological Psychiatry (Atlantic City, N.J.), June 1963. Joseph Wortis, Ed. Plenum Press, New York, 1964. 292 pp. Illus. \$13.50. Five parts: Certain Neurobiologic Substrates of Behavior, Normal and Pathologic; The External Milieu: Sensory and Sleep Deprivation, Clinical-Psychological; The External Milieu: Sensory Isolation in the Human: Mechanisms Involved in Observed Effects; The Internal Milieu: Behavioral Effects of Experimental Manipulations; and The Internal Milieu: Clinical Responses to Controlled Manipulation.

Recent Advances in the Embryology of Angiosperms. P. Maheshwari, Ed. International Soc. of Plant Morphologists, Univ. of Delhi, Delhi, India, 1963. 477 pp. Illus. Fourteen papers: "History and present status of plant embryology," P. Maheshwari; "Male gametophyte," K. Steffen; "Ovule," R. N. Kapil and I. K. Vasil; "Female gametophyte," B. M. Johri; "Fertilization," K. Steffen; "Endosperm," R. N. Chopra and R. C. Sachar; "Embryo," P. Crété; "Apomixis," E. Battaglia; "Polyembryony," P. Maheshwari and R. C. Sachar; "Artificial culture of embryos," Mary E. Sanders and Nancy Kent Ziebur; "Control of fertilization and embryo development," N. S. Rangaswamy; "Plant embryos as reaction systems," C. W. Wardlaw; "Fruit development," J. P. Nitsch; and "Embryology and taxonomy," B. M. Johri.

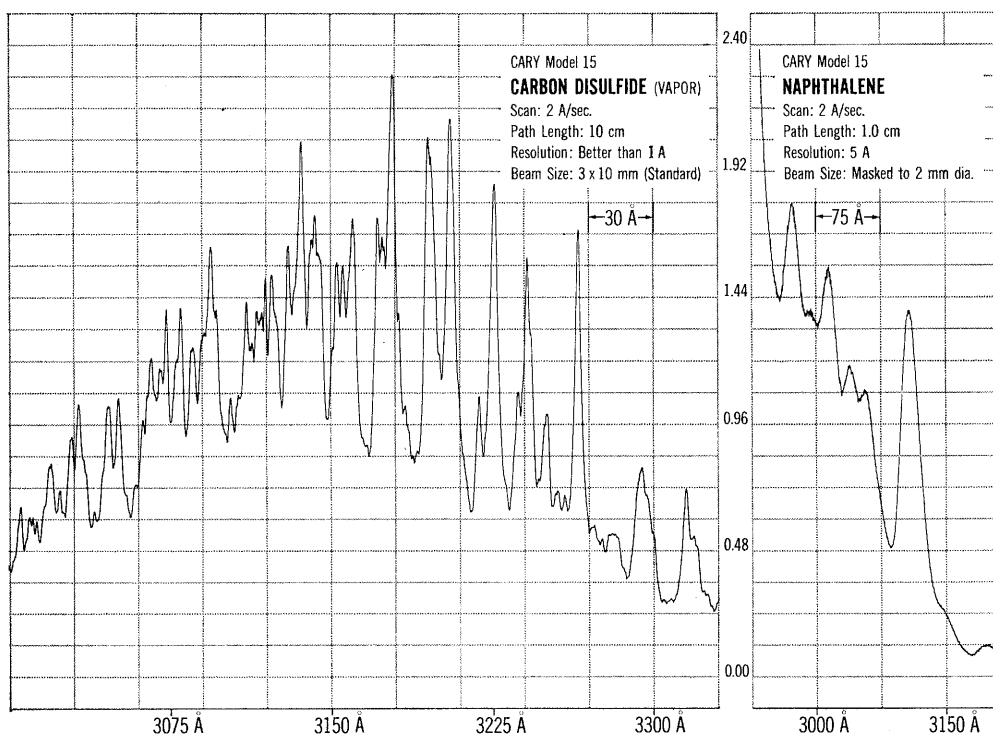
A Stereotactic Atlas of the Brain Stem of the Cat. Comprising the cord, the medulla oblongata, the pons, and the mesencephalon. pts. 1 and 2. W. J. C. Verhaart. Davis, Philadelphia, 1964. pt. 1, 90 pp. (text); pt. 2, unpaginated (plates). \$24.50.

The Story of the Plant Kingdom. Merle C. Coulter. Revised by Howard J. Dittmer. Univ. of Chicago Press, Chicago, ed. 3, 1964. 477 pp. Illus. \$5.75.

Studies on the Physiology of Phase Induction in Locusta Migratoria Migratorioides. R. Staal and F. G. B. Staal. Veenman and Zonen, Wageningen, Netherlands, 1961. 132 pp. Illus. Paper, Fl. 14.75.

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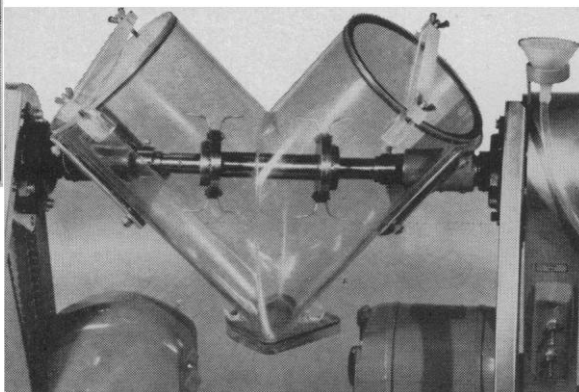
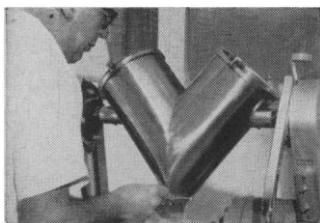
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(Tallahassee, Fla.), May 1963. Matthew J. Wayner, Ed. Pergamon, London; Macmillan, New York, 1964. 578 pp. Illus. \$20.

The Thyroid Gland. vols. 1 and 2. Rosalind Pitt-Rivers and W. R. Trotter, Eds. Butterworth, Washington, D.C., 1964. vol. 1, 454 pp. \$18.50; vol. 2, 337 pp. Illus. \$13.50.

Veterinary Toxicology. Annals of the New York Academy of Sciences, vol. 111, art. 2. Harold E. Whipple, Ed. The Academy, New York, 1964. 253 pp. Illus. Paper, \$5. Twenty-five papers that resulted from a conference on problems related to the general increase in the use of chemicals in livestock husbandry and agriculture. The conference, which was sponsored by the Academy and the American College of Veterinary Toxicologists, was held in July 1963.

Vitamin B₁₂ Coenzymes. Annals of the New York Academy of Sciences, vol. 112, art. 2. Harold E. Whipple, Ed. The Academy, New York, 1964. 375 pp. Illus. Paper, \$7. A series of 36 papers presented at a conference held in April 1963. The sections are entitled Chemistry, Chemical Synthesis, and Biosynthesis of Corrin Coenzymes; Enzymic Roles of Cobamide Coenzymes; and B₁₂-Coenzymes in Microorganisms and Animals.

The Yorkshire Jurassic Flora. vol. 2, *Caytoniales, Cycadales and Pteridosperms.* Thomas Maxwell Harris. British Museum (Natural History), London, 1964. 199 pp. Illus. Plates. £6 10s.

General

The Natural Philosopher. Papers devoted to the history of physics and to the influence of physics on human thought and affairs through the ages. vol. 2. Daniel E. Gershenson and Daniel A. Greenberg, Eds. Blaisdell, New York, 1963. 135 pp. Illus. Paper, \$1.95; cloth, \$2.95. Contents: The first chapter of Aristotle's "Foundations of scientific thought" (a new translation by the editors); "Einstein's first paper on quanta," by M. J. Klein; "The great van Marum electrical machine," by B. Dibner; and "The quantification of the concepts of electric charge and electric current," pt. 1, by W. J. King.

Polish Research Guide, 1964. Jerzy Koztowski, Ed. Translated by Lidia Damm. Published for the National Science Foundation (Washington, D.C.) by Centralny Instytut Informacji, Warsaw, Poland, 1963 (order from Office of Technical Services, Washington 25, D.C.). 431 pp. Paper, \$4.25. Contents: The institutions covered include the Polish Academy of Sciences (names of members are provided as well as a list of the attached research institutes, committees, and commissions); governmental research institutes for the application of nuclear energy; universities and colleges; other research institutions; archives, museums, and research libraries; learned societies and scientific-technical organizations. The guide is based on information supplied by the institutions and is correct as of March 1963 (in some cases corrected to June 1963).

Religion Ponders Science. Edwin P. Booth, Ed. Appleton-Century, New York, 1964. 314 pp. \$5.95.