Seismology

Earthquakes and Earth Structure. John H. Hodgson. Prentice-Hall, Englewood Cliffs, N.J., 1964. x + 166 pp. Illus. Paper, $3.95.

Recent events in Alaska should stimulate a demand for this excellent popular account of earthquakes and their scientific investigation. The reader will find here answers to many of the questions that seismologists are asked following any disastrous earthquake: What causes earthquakes? Can earthquakes be predicted? Why do earthquakes produce "tidal waves"? One common question has been omitted, however: Can earthquakes be set off, accidentally or otherwise, by nuclear explosions?

The first one-third of the book describes effects produced by nine "typical" earthquakes, six of them in North America. These were selected to illustrate scientific and engineering points as well as effects on persons and inanimate objects. Following this, a few pages are devoted to an explanation of the principles underlying seismogram interpretation.

The second third of the book, which seems to be directed to a more sophisticated audience, describes the use of seismic waves in deducing internal earth structure. Terms from geology and physics are used without explanation. The discussion of the causes of earthquakes is somewhat speculative, ranging as far afield as paleomagnetism.

Methods for minimizing earthquake damage are considered in the third section. Design considerations for earthquake-resistant structures are particularly well presented.

One feature that sets this book apart from its predecessors—for example Eiby or Macelwane—is its mention of current seismological research. Earthquake seismology has experienced a quiet revolution in the past 15 years, with major advances in the study of surface waves, earthquake mechanism, and instrumentation. Hodgson's attempt to describe these for the nonseismologist is, at the very least, a good try.

The author's credentials are impressive. In addition to his position as chief of the Division of Seismology at the Dominion Observatory (Ottawa, Canada), he is also president of the International Association of Seismology and Physics of the Earth's Interior. He is the author of several dozen papers, many of which deal with earthquake mechanism. He has endeavored to overcome the handicap that results from the regrettable (to a seismologist) lack of major earthquakes in Ottawa by extensive travel, including a UNESCO seismological mission through South America.

His writing is clear, informal, and easy to read. The first half of the book can be recommended to the general public. Scientists from other fields will have no difficulty with the last half, except possibly for an occasional undefined term. Minor criticisms might be directed to a moderate number of misprints, inadequate legends on some of the figures, and the mixed use of miles and kilometers.

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Cybernetics

Brains, Machines, and Mathematics. Michael A. Arbib. McGraw-Hill, New York, 1964. xiv + 152 pp. Illus. $6.95.

"The literature [on cybernetics]," Arbib asserts, "contains a hard core of competent papers which really add to our understanding of the common ground of 'brains, machines, and mathematics,' where mathematics is used to exploit analogies between the working of brains and the control-computation-communication aspects of machines. I believe that these papers constitute the kernel of a new, exciting, and valid extension of human knowledge." This book, rewritten from lecture notes for a course on the subject, is essentially an exegesis of these papers.

Assuming perhaps a year of calculus on the part of his readers, Arbib takes them through discussions of real and artificial neural networks, finite automata and Turing machines, research by Lettvin and his associates on the frog's visual system, reliable computation with unreliable elements, basic concepts from information theory, communication theory, and Wiener's *Cybernetics*, and Gödel's incompleteness theorem. The original sources tend to be dealt with one by one, typically with substantial amounts of quotation and paraphrasing. The writing is attractive and refreshing, and the author consistently introduces his readers into the structure of each topic, rather than merely conducting them on a superficial tour around the ideas. An appendix that covers the basic notions of set theory is provided for those not familiar with them. However, the degree of fluency assumed in these ideas is substantial, and the reader who cannot think in functional terms is unlikely to be able to get very far into this book. Praiseworthy efforts are made throughout—for example, in the treatment of the relation between real and artificial neurons—to make plain the differences between natural systems and mathematical models of them, as well as the similarities between them.

Arbib worked at Massachusetts Institute of Technology for several years, and despite its general title, his book deals mainly with ideas and materials developed there. The orientation is that of Wiener, McCulloch, and their associates: other approaches—for example, what Arbib terms "cybernetic psychology and artificial intelligence"—are barely mentioned. With this restriction understood, however, the book may be recommended as a well-written and worthwhile introduction to its subject.

The illustrations throughout are very helpful, and the overall level of production and execution is high. But, at $6.95 for 150 smaller-than-usual pages, the book is not likely to attract unruly mobs at the booksellers.

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Feigl Anniversary Volume

Analytical Chemistry, 1962. Philip W. West, A. M. G. MacDonald, and T. S. West, Eds. Elsevier, New York, 1963. xii + 411 pp. Illus. $16.

Although this book is entitled *Analytical Chemistry, 1962*, it is actually the proceedings of the International Symposium held at Birmingham University (Birmingham, England), in April 1962, in honor of Fritz Feigl and to commemorate his 70th birthday. The book is not a reference volume on spot tests but rather a record of the technical papers that were presented at

the various sessions of the symposium. More than 60 lectures ranging in theme from classical procedures to the most modern instrumental techniques were presented.

In a biographical sketch Feigl's varied experiences are reviewed. Despite adversities connected with World War II, he maintained a high degree of productivity and published some 350 to 400 papers, books, and patents.

During the symposium there were three plenary lectures, all of which illustrated Feigl's well-known scientific acumen. The first of these was entitled "The applications and implications of specific, selective, and sensitive reactions." The authors who contributed papers highlight the simplicity of most spot tests, the importance of new and effective reagents, and the necessity of considering the reactions associated with these reagents. In reviewing some of Feigl's major contributions to spot tests, they note that chelates were involved in a high proportion of the tests. Although many tests can be applied without a full understanding of the reactions involved, much can be said in favor of the presentation of spot-test chemistry at a senior or graduate level. Spot-test chemistry has made an important contribution in extending our knowledge of specific and selective reactions.

The second plenary lecture is entitled "From spot tests to spot colorimetry." Malissa reviews the various attempts to apply colorimetry and photometry to spot tests and notes that variables in the behavior of the paper used as a base for the spots play an important role. The nonuniformity of spots on paper has been observed, and among the techniques used to solve this problem, the ring oven gives impressively accurate results. With respect to materials other than paper, the favorable aspects of agar-agar are described. In measuring color and intensities, the modern trend toward the use of precise photometers often creates difficulties. The capacity of the human eye to compare standards and unknowns is commonly underestimated. Malissa concludes that "We can hope finally to achieve true quantitative evaluation of spots" and that "the real bottle neck is the paper."

The third plenary lecture, "The development of organic reagents in inorganic analysis," is by Frank Welcher. This is excellent reading for those who are interested in research in this field, not only because Welcher highlights the importance of Feigl's "Tupfelreactionen," but also because he reviews those topics that have an important bearing on the study of spot tests and color reactions. A few among these topics are chelate compounds and analytical properties, chelate forming structures in organic molecules, specific atomic groupings, the effects of substitution on analytical properties, hydration centers, and the weighting effect.

The other contributions to the symposium have been grouped under the following headings: Spot Tests and Qualitative Analysis; Semiquantitative Spot-test Methods; Organic Reagents and Their Applications; Electrochemical Methods of Analysis; Radiochemical Methods of Analysis; Optical Methods; Separation Processes; Titrimetric Analysis; and Miscellaneous Papers.

Some of the papers are general in scope, but most are contributions to specific areas of modern analytical chemistry. It would be difficult to select specific contributions of outstanding content, because so much would depend on an individual's interest. Suffice it to note that the book deserves careful examination, not only by those who are interested in tests for functional groups, anions, and cations, but also by those who are interested in the special contributions that elaborate chemical reactions. The contents are well organized and easy to read.

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New Books

Mathematics, Physical Sciences, and Engineering

Advances in Chemical Engineering. vol. 4. Thomas B. Drew and John W. Hoopes, Jr., Eds. Academic Press, New York, 1963. 384 pp. Illus. $14. Five papers: "Mass-transfer and interfacial phenomena," J. T. Davies; "Drop phenomena affecting liquid extraction," R. C. Kintner; "Patterns of flow in chemical process vessels," Octave Levenspiel and Kenneth B. Bischoff; "Properties of concurrent gas-liquid flow," Donald S. Scott; and "A general program for computing multistage vapor-liquid procseses," D. N. Hanson and G. F. Somerville.

Advances in Heat Transfer. vol. 1. Thomas F. Irvine, Jr., and James P. Hartnett, Ed. Academic Press, New York, 1964. 471 pp. Illus. $16. Five papers: "The interaction of thermal radiation with conduction and convection heat transfer," R. D. Cess; "Application of integral methods to transient nonlinear heat transfer," Theodore R. Goodman; "Heat and mass transfer in capillary-porous bodies," A. V. Luikov; "Boiling," by G. Leppert and C. C. Pitts; "The influence of electric and magnetic fields on heat transfer to electrically conducting fluids," Mary F. Romig; "Fluid mechanics and heat transfer of two-phase annular-dispersed flow," Mario Silvestri.

Applications of Neutron Diffraction in Chemistry. G. E. Bacon. Pergamon, London; Macmillan, New York, 1963. 153 pp. Illus.

Advances in Organic Geochemistry. Proceedings of an international meeting (Milan, Italy), September 1962. Umberto Colombo and G. D. Hobson, Eds. Pergamon, London; Macmillan, New York, 1964. 498 pp. Illus. $17.50. Thirty nine papers presented at the first international meeting of the European Branch of the Organic Geochemistry Group of the Geochemical Society. The O.G.G. was formed in November 1960 at the society's Denver meeting, and the European Branch was organized in the spring of 1961. At this meeting, which was cosponsored by the Lombard branch of the Societa Chimica Italiana, 120 geochemists and others from Europe, America, Africa, and Asia were present "to discuss their research, and to review problems relating to the geochemistry of organic materials in the Earth's crust, such as petroleum and coal, as well as less highly concentrated but more widespread organic matter present in various rocks, soils and waters."

Alicyclic Compounds. Douglas Lloyd. Elsevier, New York, 1964. 181 pp. Illus. $6.50.

Building Up Mathematics. Z. P. Dienes. Hutchinson, London; Humanities Press, New York (© 1960), 1964. 124 pp. Illus. $3.

Cavitation and Hydraulic Machinery. F. Numachi, Ed. Proceedings of a symposium (Sendai, Japan), September 1962. Institute of High Speed Mechanics, Tohoku Univ., Sendai, Japan, 1963. 574 pp. Illus. Twenty eight papers presented at a symposium sponsored by the International Association for Hydraulic Research. The papers are subdivided into three sections: Cavitation, Hydraulic Machinery, and Marine Propellers.

Chemical Bond Approach Project: Investigating Chemical Systems. Teachers' guide. McGraw-Hill, New York, 1964. Unpaged. Illus. $5 (laboratory sheets).

Chemical Thermodynamics. Basic theory and methods. Irving M. Klotz. Benjamin, New York, revised ed., 1964. 484 pp. Illus. $9.75.

The Chemistry of Cements. vol. 1. H. F. W. Taylor, Ed. Academic Press, New York, 1964. 472 pp. Illus. $14.

The Chemistry of Imperfect Crystals. F. A. Kröger. North-Holland, Amsterdam; Interscience (Wiley), New York, 1964. 1055 pp. Illus. $33.

College Chemistry. Linus Pauling. Freeman, San Francisco, ed. 3, 1964. 856 pp. Illus. $8.25.

College Physical Science. Vaden W. Miles, Everett R. Phelps, G. Ray Sherwood, and Willard H. Parsons. Harper and Row, New York, 1964. 555 pp. Illus. $7.95.

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