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