large (easily measured) distances and small distances, for which one even has trouble giving an operationally defined basis for Euclidean geometry. Since this distance is about 0.005 centimeter at room temperature, this is a very odd result indeed. The slip amounts to confusing the temperature of the *source* of radiation used in measurement with the temperature of the object of interest and is pointed out here because it might bother the many students sure to use the book (and with profit).

The last four chapters comprise further applications to telecommunications (effects of noise, Tuller-Shannon formula), writing, printing and reading, the problem of computing, and a concluding general discussion of information, organization, semantic information, and some other topics. They are clear and well written and should be valuable to students. The fields of the last two chapters are moving rapidly, so much so that they are to be considered more or less introductory to current work rather than as an up-to-date picture.

To sum up, this book is one of the best available introductions to modern information theory and to some of its applications in physics (primarily) and other fields. It is recommended for practicing scientists, graduate students, and mature undergraduates.

JEROME ROTHSTEIN
Signal Corps Engineering Laboratories

Atoms and Energy. H. W. S. Massey. Philosophical Library, New York, 1956. 174 pp. Illus. $4.75.

This is a book addressed to the layman who is interested in the developments of modern physics, and, although considerable space is devoted to a discussion of the release of nuclear energy, this is not the entire theme of the book. First are sketched the properties of the main building blocks of matter—the electron, the proton, and the neutron—and how these combine to form atoms. The second chapter discusses the combination of atoms and the release of chemical energy, either controlled or explosive, thus providing an analogy for the discussion of nuclear reactions and energy release. The third chapter is a brief description of nuclear physics to 1940, and Chapter 5 describes the large-scale release of atomic (nuclear) energy, including energy production in the stars. Chapter 6 is entitled "Atomic energy in the service of man." Here are discussed the possible applications in biology—for example, production of mutations, therapeutic and diagnostic applications, isotopic tracers—and in atomic power and atomic weapons. The final chapter deals with present research in high-energy physics, including mesons, neutrinos, and positrons, but, of course, none of the exciting events since 1952. The book is easy to read (not a single mathematical equation appears) and the necessary background is certainly not greater than high-school general science. It is, perhaps of necessity, rather sketchy in many places. The style is rather drab, and I failed to feel the excitement that I felt when I read Eddington and Jeans, but perhaps my appetite is now jaded with age. Massey writes from a thorough knowledge of the field, and this book is to be recommended to the reader of limited background in physics who wishes to know something of atomic and nuclear physics.

R. D. MYERS
Physics Department,
University of Maryland

Automata Studies. C. E. Shannon and H. McCarthy. Princeton University Press, Princeton, N.J., 1956. 285 pp. $4.

This book, which is a collection of papers on the general subject of automata, presents a picture of the state of research in the field as of 1953, when its contents were assembled. It is divided into three parts: "Finite automata," "Turing machines," and "Synthesis of automata." The papers in the first part show clearly the influence of data from neurological research, dealing mainly with the construction from basic elements, called "neurons," of machines designed to react to any set taken from a finite number of stimuli in any one of a finite number of ways. The papers of the second part represent advances in the now well-known theory of Turing machines. The first two papers deal with universal Turing machines, the third with the question of inversion of functions defined by Turing machines, and the fourth with the influence of unreliable elements on Turing computability.

Various simplifications are inherent in the studies of the first part: components of automata, rather than integrated machines, are studied; the possibility of infinite numbers of inputs and outputs is neglected; time, usually thought of as continuous, is taken to be discrete, the state of components being considered only at discrete moments; components are assigned fixed probabilities of misfiring, when in fact it is more likely that this type of misconduct is random.

These simplifications bear fruit for the studies of the third section, where these parts are combined into larger machines that can react to stimuli in a more complicated way. The first paper in this section considers the automaton as an amplifier that modifies the intelligence of its operator in much the same way that a crane would amplify the energy of its operator. The second paper considers ways in which a machine might be able to represent within itself data from the physical field within which it finds itself. The last two papers deal with conditioned reflexes and temporal and spatial patterns in relation to conditional-probability machines. The investigations of this section are concerned with the logical possibility of constructing given machines out of available parts, and hence exhibit some disregard for questions of economy of time and materials.

The papers in this volume seem appropriately chosen for various reasons. First, they are eminently readable, even to one unschooled in the terminology of the field. Most of the papers contain a good quantity of expository material in which it is explicitly stated what assumptions and what simplifications are being made, and in which is stated the point of view of the author concerning the relation of biology and mechanism. Second, the selection and order of the papers gives the reader insights into many different avenues of approach to the problem of automata. Third, the authors of many of the papers include discussions of the limitations of their work and indications of the numerous matters in which further investigation is needed. To be sure, making the reader aware of the vastness yet to be investigated is one of the book's greater accomplishments.

E. J. COGAN
Mathematics Department,
Dartmouth College

Fluid Models in Geophysics. Proceedings of the first symposium on the use of models in geophysical fluid dynamics. Held at Johns Hopkins University, 1–4 Sept. 1953. Robert R. Long, Ed. Sponsored by the Office of Naval Research, Geophysics Research Directorate, and the U.S. Weather Bureau. Government Printing Office, Washington 25, 1956. 162 pp. Illus. $2.25.

Models are used more and more to study problems not easily solved by mathematical methods. In this book's section on "Dimensional analysis and similarity," S. Corrsin (pp. 1–17) summarizes fundamental data about dimensional analysis. G. W. Morgan (pp. 19–26) makes suggestions covering the subject in "Re-