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.

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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.

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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.

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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-

marks on the problem of motions in a rotating fluid." D. Fultz (pp. 27–63) gives "A survey of certain thermally and mechanically driven fluid systems of meteorological interest," including experiments to aid study of polar fronts and geostrophic motions.

H. L. Kuo's paper, "On convective instability of a rotating fluid" (pp. 65–72), discusses symmetric convection in a thin layer of an almost incompressible fluid contained in a cylindrical vessel. A paper by E. N. Lorenz on "A proposed explanation for the existence of two regimes of flow in a rotating symmetrically-heated cylindrical vessel" (pp. 73–80) and one by M. J. Rubin on "Results of recent observational studies of the southern hemisphere circulation" (pp. 81–87) are intended as bases for future model investigation. In a chiefly theoretical paper G. S. Benton (pp. 149–162) gives "A general solution for the celerity of long gravitational waves in a stratified fluid."

Small-scale phenomena are discussed by C. S. Yih (pp. 117–133), with experimental results on "Free convection due to boundary sources" and by R. R. Long (pp. 135–147) in "Models of small-scale atmospheric phenomena involving density stratification," including flow over a barrier. W. S. von Arx (pp. 89–99) discusses, in "Some techniques for laboratory study of the primary ocean circulation," model experiments to investigate the vorticity theory of the circulation in a realistically shaped ocean, the exchange of water between the North Atlantic Ocean and the Arctic Ocean, and the Gulf Stream system. R. Hide (pp. 101–116), in "Fluid motion in the earth's core and some experiments on thermal convection in a rotating liquid," describes experiments suggested by S. K. Runcorn to study motions which possibly occur in the liquid core of the earth and could produce the earth's magnetic field.

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Gmelins Handbuch der Anorganischen Chemie. vol. 44. **Thorium and Isotopes.** Edited by Gmelin Institute under the direction of E. H. E. Pietsch. Verlag Chemie, GmbH., Weinheim, Bergstrasse, ed. 8, 1955. 406 pp. Illus. $55.68.

This volume on thorium and its isotopes supersedes the chapter on thorium in the 7th edition, which was published in 1928. Whereas that chapter was prepared by one author, the present work is the result of the combined effort of some 14 or more coworkers. The new text is about three times the length of the older one. The whole chapter has been completely rewritten and covers the literature to 1949 and, in certain instances, to 1954.

Discussion of the extraction of thorium from its ores, of the reactions whereby thorium is separated from other elements, of the preparation of metallic thorium in different forms, and of the preparation of thorium compounds is given in much more detail than formerly.

An outstanding feature of this newer version is the inclusion of the mass of information that was obtained during World War II and that has been obtained since World War II concerning the nuclear chemistry and physics of thorium and its isotopes. The addition of this material greatly enhances the value of the treatise.

Prepared with the painstaking care and thoroughness characteristic of the modern Gmelin series, this volume on thorium comprises a comprehensive account of the element, its isotopes, and its compounds.

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Advances in Catalysis and Related Subjects. Vol. VII. W. G. Frankenburg, V. I. Komarewsky, E. K. Rideal, Eds. Academic Press, New York, 1955. xi + 362 pp. $9.

It becomes increasingly clear that heterogeneous catalysis mechanisms are dominated by the electronic factor and the effect of defect solid structures. Modern workers have given much attention to these complex matters, and the present volume in this excellent series strongly reflects this situation.

Volume 7 begins with "The electronic factor in heterogeneous catalysis" by M. McD. Baker and G. I. Jenkins, which presents an excellent review of solid-state theory of metals and semiconductors as it pertains to catalysis. Chemisorption and catalysis on semiconductors is continued through three further contributions: "Chemisorption and catalysis on oxide semiconductors" by G. Parravano and M. Boudart, "The application of the theory of semiconductors to problems of heterogeneous catalysis" by K. Hauffe, and "Surface barrier effects in adsorption, illustrated by zinc oxide" by S. Roy Morrison. Further contributions stressing metals are: "Field emission microscopy and some applications to catalysis and chemisorption" by Robert Gomer, "Adsorption on metals and its bearing on catalysis" by J. A. Becker, and "Electronic interaction between metallic catalysts and chemisorbed molecules by R. Suhrmann. These chapters are intermixed with the first group. In between, E. Cremer discusses his "Compensation effect in heterogeneous catalysis," which concerns the often prevalent case of simultaneous increase of entropy of activation and heat of activation as the catalytic conditions are changed.

All of these contributions are uniformly good, and the text is well printed and mostly free from errors. As a reviewer of a previous volume indicated, it would be helpful if each volume were restricted to a definite specialty. At least, the arrangement could be improved, and some duplication between authors could be prevented.

Komarewsky eulogizes N. D. Zelinsky and his work in the beginning of the book.

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New Books

Sodium, Its Manufacture, Properties and Uses. Marshall Sittig. With a chapter on "The physical and thermodynamic properties of sodium" by George Wm. Thomson and Edward Garelis. Reinhold, New York; Chapman & Hall, London, 1956. 529 pp. $12.50.

The Rain Forests of Golfo Dulce. Paul H. Allen. University of Florida Press, Gainesville, 1956. 417 pp. $8.50.

The Dinè: Origin Myths of the Navaho Indians. Smithsonian Institution Bureau of American Ethnology Bull. 163. Aileen O'Bryan. U.S. Government Printing Office, Washington 25, 1956. 187 pp. $1.75.

The Blue Book of Awards. A compilation of major prizes, medals, honors and distinctions, including significant graduate scholarships and fellowships, open to citizens of the United States and Canada; indexed by donors and classified by fields. Herbert Brooks, Ed. Marquis—Who's Who, Chicago, Ill., 1956. 186 pp.

Man's Role in Changing the Face of the Earth. William L. Thomas, Jr. University of Chicago, Chicago, Ill. 1956. 1193 pp. $12.50.

The Structure of Wood. F. W. Jane. Macmillan, New York, 1956. 427 pp. $9.50.

In Search of Adam. The story of man's quest for the truth about his earliest ancestors. Herbert Wendt. Trans. by James Cleugh. Houghton Mifflin, Boston, Mass., 1956. 540 pp. $6.50.

Dead Towns and Living Men. Leonard Woolley. Philosophical Library, New York, 1956. 220 pp. $6.

Mandl's Television Servicing. Matthew Mandl. Macmillan, New York, rev. ed., 1956. 460 pp. $6.50.

Protozoologie. Karl G. Grell. Springer, Berlin, 1956. 284 pp. DM. 59.

Chazyan and Related Brachiopods. pt. 1, text; pt. 2, plates. G. Arthur Cooper. Smithsonian Institution, Washington, 1956. 1263 pp. 269 plates.

Linear Transient Analysis. vol. II, *Two-Terminal-Pairs Networks Transmission Lines.* Ernst Weber. Wiley, New York; Chapman & Hall, London, 1956. 452 pp. $10.50.