

be expected, as in the recent numerical analysis methods of Roesler and Pearson. For following future developments, Professor Gross's book will be a most valuable guide.

The quality of paper and printing is excellent, and, even though English was presumably not the printer's native tongue, only three minor typographical errors have been found by the reviewer.

Basic Mechanisms in Radiobiology: II, Physical and Chemical Aspects. Highland Park Conference, May, 1953. Edited by John L. Magee, Martin D. Kamen, and Robert L. Platzman. 145 pp. Subcommittee on Radiobiology, Committee on Nuclear Science, National Research Council, Government Printing Office, Washington, D. C., 1953. \$1.00. *Reviewed by J. G. Hoffman, Roswell Park Memorial Institute.*

Selling at one dollar per copy, this book is a real bargain. Its one-hundred and forty-five pages are indexed by author, subject, and institutions. If measured only by total wordage about radiobiology, it would be a good buy. There happens to be a remarkable kind of a discussion embodied in its pages. The editorial committee has put in writing what may be called a bull session. Perhaps the quickest way to convey the impression of the book is to have you imagine, if you can, the dialogues of Plato or one of Shaw's polemical plays written on radiation chemical effects pertaining to radiobiology.

There are five short chapters. The titles serve to indicate the formidable tasks undertaken by the conferees. The first deals with Initial Energy Transfer From Incident Radiation to Matter, which centers about the problems of measuring stopping powers. Chapter 2, called Energy Transfer From Secondary Electrons to Matter, tells of the life of an ionized electron among water molecules and how it becomes hydrated. About half way through the chapter, the discussion is turned to dry materials and other substances much more complex than pure water.

Chapter 3, entitled Mechanisms of Energy, Degradation and Chemical Change: Effects of Secondary Electrons, attempts to describe the movements of secondary electrons having energies in the vicinity of ten electron volts and lower. The various theories of the spatial distribution of radicals and the electric fields involved are discussed but the result is that there is no clear cut picture of events between the time at which an electron has ten electron volts energy and the final state in which ions are distributed throughout tissue space. Chapter 4 has the same title as chapter 3 except that its subtitle is: Effects of Electronic Excitation. The role played by electronic excitation in radiobiology has not been receiving the attention it merits. This chapter is a high light of the book and will certainly please students of basic radiobiology, especially those inclined toward physical analysis. The fifth and last chapter, called, Importance of Radiation Chemical Effects in Radiobiology, provides some excellent searching into

the basic theories of biological action. Even the so-called "point heat" effects which underlie one of the earliest theories of radiation effects are brought under scrutiny. The ideas range from the oldest heat theories on up to the most recent findings in photo-reactivation which in turn seems to be comparable to the Herschel Effect in photographic emulsions.

The conversational discourse provides a means for communicating complex subject matter with an absolute minimum of words. As a result the density of ideas per paragraph runs unusually high. The very technical point of view taken throughout the conference makes this good reading for physicists and physical chemists. There are four tables and four figures supplementing an excellently documented text.

Nuclear Engineering

Introduction to Nuclear Engineering, by Richard Stephenson (387 pp.; McGraw-Hill, New York, 1954; \$8.00), is another of the many texts on this topic published recently, this one in the excellent McGraw-Hill Chemical Engineering series. (Another book with the same title, authored by Raymond L. Murray, was published almost simultaneously by Prentice-Hall.) A widespread argument among engineering educators is raging at present regarding whether nuclear engineering should be established as a separate department in engineering schools, or whether the basis of the existing curricula should be broadened to give the average engineering graduate enough background to specialize in this field on the graduate level, or perhaps even later in his career. The present book is excellently suited to the latter procedure; it takes familiarity of the standard engineering operations for granted and discusses only such fairly advanced topics as nuclear fission and chain reaction, reactor theory, construction and control, isotope separation and processing, and other special techniques of nuclear engineering. This well-assembled and excellently indexed text will be useful both as a first introduction to the subject for the novice, and as a handbook for more experienced men.

Economics

Many of the phenomena encountered in the study of economic systems have remarkable analogs in control-system engineering. Such notions as feedback and stabilization (in the sense of preventing unwanted oscillations), originally developed for use in, say, automatic pilots for aircraft, can be profitably employed in economic analysis as well. This view is expounded by Arnold Tustin, Professor of Electrical Engineering at Birmingham University, in *The Mechanism of Economic Systems* (161 pp.; Harvard University Press, Cambridge, 1954; \$5.00). His treatment is an interesting and convincing example of what happens when a complex problem in the social sciences is given an appropriate mathematical discussion. Economists traditionally construct "models" on paper of the operation

of economic systems. Tustin suggests transmuting these models into analog computers to investigate their functioning in detail, and he gives specific designs that might find such application. A long chapter on the mathematical analysis of system behavior makes the book self-contained for the novice. Altogether a stimulating and intriguing study that many physicists will find of interest.

Combustion

The *Fourth Symposium on Combustion* (926 pp.; The Williams and Wilkins Co., Baltimore, Maryland, 1953; \$7.00) is a collection of summaries of nine survey papers, one hundred and three contributed papers, and the transcriptions of two round table discussions on combustion and detonation waves. The material was presented at an international symposium held at Massachusetts Institute of Technology, September 1952. The symposium emphasized the physical problems of combustion, particularly the experimental and theoretical aspects of wave phenomena and turbulence. The topics included flammability, ignition, laminar combustion and detonation waves, cellular flames and oscillatory combustion, turbulent flames, stabilization by flame holders, flames of fuel jets, burning of fuel droplets and combustion in rockets and engines. Although the book is directed primarily to workers in the field, its organization and the detailed survey papers make it a relatively simple matter for the outsider to become familiar with the subject. The various experimental and analytical techniques presented would alone recommend it to all physicists.

Progress in Physics

The latest edition of *Reports on Progress in Physics* (Vol. XVII; edited by A. C. Stickland; 280 pp.; The Physical Society, London, 1954; Non-Fellows £2 10s, Fellows 27s 6d) contains a total of eight articles on various topics of current interest. The first, by M. H. L. Pryce, is a summary of the present state of nuclear shell structure with emphasis on recent work. Diffraction theory is considered by C. J. Bouwkamp, whose comprehensive review is both a survey of progress in the field and an introduction to general diffraction theory. Papers by J. Alan Chalmers and C. W. Allen deal with several aspects of atmospheric electricity and the physical condition of the solar corona respectively. A short contribution by Edward Teller is devoted to the origin of cosmic rays. Atomic valence states and chemical binding are considered by W. Moffitt, who presents a general theory of the electronic structure of molecules. Experimental and theoretical work on antiferromagnetism are summarized by A. B. Lidiard, and the last paper, by B. H. Briggs and M. Spencer, surveys existing knowledge of horizontal movements in the ionosphere as obtained by radio methods. Each article is also available as an individual monograph: for information, write to The Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S. W. 7.

Books Received

ART IN SCIENCE. 32 plates from *Scientific American*. Simon and Schuster, Publishers, New York, 1954. \$6.00.

EINIGE FRAGEN ZUR THEORIE DER LUMINESZENZ DER KRISTALLE. By E. I. Adirawitsch (Translated from Russian by H. Vogel). 298 pp. Akademie-Verlag, Berlin, East Germany, 1953. DM 19.00.

ADVANCES IN CATALYSIS AND RELATED SUBJECTS. Volume VI. Edited by W. G. Frankenburg, V. I. Komarewsky, and E. K. Rideal. 467 pp. Academic Press Inc., New York, 1954. \$10.50.

MASS SPECTROMETRY. By A. J. B. Robertson. 135 pp. (Methuen & Co., England) John Wiley & Sons, Inc., New York, 1954. \$2.00.

EXPLORING MARS. By Robert S. Richardson. 261 pp. McGraw-Hill Book Company, Inc., New York, 1954. \$4.00.

INTRODUCTION TO THEORETICAL MECHANICS. By Robert A. Becker. 420 pp. McGraw-Hill Book Company, Inc., New York, 1954. \$8.00.

MAGNETIC CONTROL OF INDUSTRIAL MOTORS (Second Edition). By Gerhart W. Heumann. 714 pp. John Wiley & Sons, Inc., New York, 1954. \$9.50.

PHYSIKERTAGUNG INNSBRUCK, HAUPTVORTRÄGE (September 1953 Conference). Edited by H. Auer, E. Brüche, and R. Steinmauer. 138 pp. Physik Verlag, Mosbach/Baden, Germany, 1954. DM 19.20.

TREASURY OF PHILOSOPHY. Edited by Dagobert D. Runes. 1280 pp. Philosophical Library, New York, 1954. \$15.00.

RELATIVITY FOR THE LAYMAN. By James A. Coleman. 131 pp. The William-Frederick Press, New York, 1954. \$2.75.

APPLIED GEOPHYSICS IN THE SEARCH FOR MINERALS (Fourth Revised Edition). By the late A. S. Eve and D. A. Keys. 382 pp. Cambridge University Press, New York, 1954. \$7.50.

NUCLEAR GEOLOGY (A Symposium on Nuclear Phenomena in the Earth Sciences). Edited by Henry Faul. 414 pp. (Chapman & Hall, England) John Wiley & Sons, Inc., New York, 1954. \$7.00.

MATERIAL AND ENERGY BALANCES (Second Edition). Part I of Chemical Process Principles. By Olaf A. Hougen, Kenneth M. Watson, and Roland A. Ragatz. 504 pp. (Chapman & Hall, England) John Wiley & Sons, Inc., New York, 1954. \$8.50.

ACTIONS OF RADIATIONS ON LIVING CELLS (Second Edition). By the late D. E. Lea. 416 pp. Cambridge University Press, New York, 1955. \$6.00.

DEVELOPMENT OF THE GUIDED MISSILE (Second Revised Edition). By Kenneth W. Gatland. 292 pp. (Iliffe & Sons, England) Philosophical Library, Inc., New York, 1954. \$4.75.

THE THEORY OF COHESION. AN OUTLINE OF THE COHESIVE PROPERTIES OF ELECTRONS IN ATOMS, MOLECULES, AND CRYSTALS. Volume 2 of Metal Physics and Physical Metallurgy. By M. A. Jaswon. 245 pp. (Pergamon Press, England) Interscience Publishers, Inc., New York, 1954. \$5.75.

GLASS REINFORCED PLASTICS. Edited by Phillip Morgan. 248 pp. (Iliffe & Sons, England) Philosophical Library, Inc., New York, 1954. \$10.00.

THE DEVELOPMENT OF THE CONCEPT OF ELECTRIC CHARGE. ELECTRICITY FROM THE GREEKS TO COULOMB. Case 8 in Harvard Case Histories in Experimental Science. By Duane Roller and Duane H. D. Roller. 97 pp. Harvard University Press, Cambridge, Massachusetts, 1954. Paperbound \$1.60.