Book Reviews

General chemistry: an introduction to descriptive chemistry and modern chemical theory. Linus Pauling. San Francisco: W. H. Freeman, 1947. Pp. viii + 595. (Illustrated.) $4.25.

This contribution of Pauling to instruction in general chemistry is one of the most interesting and stimulating books to appear in the field for many years. Its directness and freshness of approach are further enhanced by the excellent illustrations of Roger Hayward (illustrator for Strong's *Procedures in experimental physics*).

The means by which Pauling has presented the subject of general chemistry is probably best shown by including a list of chapter titles, in spite of the reviewer's aversion to such a practice. The titles are, in sequence (reviewer's italics): Chemistry; Nature and Properties of Matter; *Atoms, Molecules, and Crystals*; Elements, Elementary Substances, and Compounds; *Chemical Elements and the Periodic Law, Parts 1 and 2*; Weight Relations in Chemical Reactions; *Ions, Ionic Valence, and Electrolysis*; *Covalence and Electronic Structure*; Oxidation-Reduction Reactions; Chromium and Manganese, and Related Metals; Halogens; *Laws of Electrolysis, Electrolytic Processes*; *Properties of Gases*; Water; Properties of Solutions; Sulfur; Nitrogen; *Rate of Chemical Reactions*; *Chemical Equilibrium*; *Acids and Bases*; Phosphorus, Arsenic, Antimony, and Bismuth; Solubility Product and Precipitation; Complex Ions; Copper, Silver, and Gold; Zinc, Cadmium, and Mercury; Iron, Cobalt, Nickel, and the Platinum Metals; Tin, Lead, and Other Metals; Organic Chemistry; *Chemistry of Silicon*; Thermochemistry; Oxidation-Reduction Equilibria; Radio-chemistry.

In particular, it will be noted that the subject of chemistry is introduced by discussing the properties of substances in terms of atoms and molecules, and the development of the subject follows in as logical an order as possible, without respect to historical precedence. The chapter entitled *Atoms, Molecules, and Crystals* is a very pleasing example of the reasonableness of this approach, it being much easier for the beginning student to understand how matter is built up from atoms and molecules when they are held in a relatively stationary condition than when they are moving about randomly. Following this same reasoning, the properties of gases are not presented until Chapter 14. Electrolysis and electrode reactions are considered first in Chapter 8 for molten salts, without the complication of a solvent being present and taking part in the electrode processes, electrolysis in solutions following later. The detailed consideration of acids and bases is presented in Chapter 21, after the student is prepared for the concepts introduced. Throughout the text, where the historical background is important in itself or serves to illustrate the scientific method, it is included following the logical presentation of the subject.

No previous instruction in chemistry is assumed of the student, and each new term is defined as it is introduced. Students who have previously had high school chemistry will, nevertheless, find this book a challenging and exciting experience. Although Pauling claims that descriptive chemistry is presented in a limited amount ("... enough to provide ... an introduction to the multitude of chemical substances, but not so much as to confuse ..."), the chemistry of the elements and their compounds is discussed in sufficient detail and integrated so well with atomic and molecular structure and the periodic table, that a broad knowledge of fundamental chemical facts should be retained by the student. At the end of each chapter are a section entitled "Concepts and Terms Introduced in This Chapter" and a set of thought-provoking exercises, both of which allow the student to test his mastery of the textual material.

Occasionally new and difficult ideas are perhaps introduced in too close order. An extreme example of this (by no means typical) occurs on page 67 in defining the word *acid*. Another criticism is the treatment in the text of elements of atomic number 90–96 as transition elements, even though they are properly classed as a second rare-earth group in the periodic tables presented. The text would be much more useful for the elementary student if it were more completely indexed.

Regarding the physical make-up of the book, the typography and composition are excellent, but the binding is not reinforced and is poor. The reviewer found very few errors in typography, and only one compositor's mistake, which is a splendid record for a first printing of a first edition. This is the first volume from this new publisher to come to the reviewer's attention, and sets a high standard for subsequent publications.

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Gas turbines and jet propulsion for aircraft. (4th ed.) G. Geoffrey Smith. New York: Aircraft Books; England: Flight Publishing Company, 1946. Pp. viii + 256. (Illustrated.)

In his fourth edition of *Gas turbines and jet propulsion for aircraft*, G. Geoffrey Smith attempts to bring to light some of the major accomplishments achieved in this field in the last 5 years. With this type of propulsion fast replacing the reciprocating engines in the present military airplanes, a text containing general knowledge of the subject is most timely. The author, who has dealt with aero-engines for a great many years and who is one of the best authorities on their history and development, is well qualified to be one of the first to present such a text to the public.

The author includes not only British developments but also those of the rest of Europe and America. A great many excellent illustrations of the basic physical concepts,

comparative tables, component parts, finished units, and specific applications make this book readily understandable to the layman and pilot, as well as the engineer. Quotations from papers delivered by aeronautical and turbine engineers have been freely cited to provide a broad survey of the trend of thought and progress.

The text contains chapters on Jet Propulsion, Thrust and Performance, Early Projects, Gas Turbine Components, Combustion Systems, Metallurgy, British Gas Turbines, American Gas Turbines, German Gas Turbines, Testing and Maintenance, Types of Turbine-propelled Aircraft, Jets Versus Airscrews, Turbine-Airscrew Projects, Aerodynamic Problems, Tailless Aircraft and the Flying Wing, Closed-Cycle Gas Turbines, Steam Turbines, Guided Missiles and Flying Bombs, Official Adoption of Jet Aircraft, Broadcasting the News, and Notable Views on Turbine Propulsion. The ease and simplicity, as well as the completeness, with which this book was written is indicative of the authoritative source of the information it contains.

ROBERT S. ROSS

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Introduction to electron optics: the production, propagation, and focusing of electron beams. V. E. Cosslett. Oxford, Engl.: at the Clarendon Press, 1946. Pp. x + 272. (Illustrated.) $6.50.

This book provides an excellent text or reference for a third- or fourth-year course in either electron optics, electronics, or physics where the subject matter is directed toward the understanding of the production, propagation, and focusing of beams of ions and electrons.

Essentially, in the reviewer's opinion, this book is divided into two parts. The first part, which includes the first 5 chapters, deals with a clear and concise theoretical exposition on the electrostatic field, electrostatic focusing, and magnetic focusing. Chapter V presents a trigonometrical approach to the subject of image aberrations. The appendix presents the Hamiltonian Method in Electron Optics.

With a background in calculus, partial differential equations, and an understanding of scalar and vector products as well as Bessel functions, the student or reader should gain a complete physical and mathematical understanding of the effect of electric or magnetic fields on the trajectory and focusing of an electron beam. As the author claims, the mathematical exposition is kept subordinate to the description of the physical principles. In many cases overlapping exists when first a phenomenon is explained physically and later the same phenomenon is presented mathematically. This method of presentation makes the subject matter more easily understood.

The approach to the subject of electron optics in this book is similar to geometric light optics. The optical analogy is made frequently, which enables the reader, who may have a knowledge of light optics, to gain a clearer picture of the electron system.

The second part of the book, the last 5 chapters, deals with devices in which the principles of electron optics are applied. First, the factors involving the production of an electron beam are presented. The theories on thermionic emission (centered around Richardson's equation) are discussed; the structures of various electron guns are clearly illustrated and described. In this chapter, photoelectric emission and electron multipliers are described.

In the following chapters, the cathode-ray tube, television pickup tubes, both those in the iconoscope and orthicon family, with the methods and theories used to effect the deflection of the electron beams within the tubes, are clearly presented with a minimum of mathematics. The whole of Chapter VIII is devoted to the electron microscope and gives a clear and precise picture of how the principles of electron diffraction are used in electron microscopy. The remaining two chapters deal with cylindrical fields of the type that are found in a magnetron or cyclotron and velocity-modulated beams of the type that are encountered in a Klystron. The functions of the magnetron, cyclotron, and Klystron tubes are clearly analyzed and illustrated.

It is believed that the extensive bibliographies, which are found at the end of each chapter, will be extremely helpful to those readers who wish to delve more deeply into the subject matter.

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Scientific Book Register

DAUBENMIRE, R. F. *Plants and environment: a textbook of plant autecology.* New York: John Wiley; London: Chapman & Hall, 1947. Pp. xii + 424. (Illustrated.) $4.50.

HADFIELD, GEOFFREY, and GARROD, LAWRENCE P. *Recent advances in pathology.* (5th ed.) Philadelphia-Toronto: Blakiston, 1947. Pp. viii + 363. (Illustrated.) $6.00.

LYMAN, RUFUS A. (Ed.-in-Chief.) *American pharmacy: advanced pharmacy, medical, surgical and dental supplies, animal health pharmacy.* Philadelphia-London-Montreal: J. B. Lippincott, 1947. Pp. x + 379. (Illustrated.) $7.00.

NORTHROP, F. S. C. *The logic of the sciences and the humanities.* New York: Macmillan, 1947. Pp. xiv + 402. $4.50.

ROBSON, J. M. *Recent advances in sex and reproductive physiology.* (3rd ed.) Philadelphia-Toronto: Blakiston, 1947. Pp. xii + 336. (Illustrated.) $5.75.

VAN DEN BROEK, J. A. *Theory of limit design.* New York: John Wiley; London: Chapman & Hall, 1948. Pp. viii + 144. (Illustrated.) $3.50.

VISHER, STEPHEN SARGENT. *Scientists starred 1903–1943 in "American men of science." a study of collegiate and doctoral training, birthplace, distribution, backgrounds, and developmental influences.* Baltimore: Johns Hopkins Press, 1947. Pp. xxiii + 556. $4.50.