

ter 2, and is frequently alluded to elsewhere. The general restriction of the text to chemical propulsion is stated in the preface, in chapter 2, and in chapter 5. Redundancy hits a peak when the structural formula of B_2O_3 is repeated, with only ten pages separating the two.

Despite these and other minor faults, the authors present a worthwhile summary of the principles that are important in chemical propulsion, supplemented by numerous tables of properties and derived performance characteristics of propellant systems. The discussions on the role of bond energies in defining the behavior of propellant gases will be particularly helpful to beginning students of propellant technology. Extensive tables of combustion product compositions for many systems, computed under both frozen and shifting equilibrium conditions, facilitate the calculation of performance characteristics for instructional purposes. Equilibrium dissociation data as a function of temperature for a wide variety of products is presented on graphs in the chapter on working fluid properties. The authors emphasize many propellant components—for example, fluorine, boron, and beryllium and their compounds—that represent active developmental efforts at this time; thus, the text is commendably current in areas not limited by security requirements.

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Pharmacology

Introduction to Molecular Pharmacology. William C. Holland, Richard L. Klein, and Arthur E. Briggs. Macmillan, New York, 1964. vi + 250 pp. Illus. \$7.50.

Molecular pharmacology is an exciting research field which demands that those who read about it have a considerable depth of knowledge of the physical sciences.

The authors of this "textbook" are to be commended for recognizing that descriptions of the mechanisms of action of pharmacologically active compounds must go far beyond the concept of identifying the physiological functions altered, no matter how useful such descriptions may be in a clinical

realm. However, after careful scrutiny of the material included, I have concluded that the field of molecular pharmacology is not yet ready to be compressed into the brief statement presented here.

The book is divided into three sections, called "Chemo-morphologic Basis of Molecular Pharmacology," "Free Energy Transformation in Living Systems," and, finally, "Molecular Pharmacology." The general idea seems to be that the latter section will be crystal clear if the first two are read and understood.

It appears that the authors have, in 160 of the 250 pages, condensed some of the modern, and many not so modern, concepts of physical chemistry, electronic organic chemistry, macromolecular chemistry, cellular morphology, and other sciences basic to modern pharmacology. The serious student of molecular pharmacology will necessarily have studied most of these fields in some depth; thus the sketchy extracts included here will be of little value to him. The student with a casual interest in the subject and no depth of experience from which to approach it will probably find that the presentations are not easy to comprehend. In any event, the topics are not yet clearly enough related to pharmacologic phenomena to warrant bringing this particular collection together in a book in such a brief fashion.

Some examples of specific criticisms are the following: (i) the brief one-page treatment of the work of many who have approached the interesting field of drug-induced alterations of enzyme activity or concentration of activity; (ii) the limited seven-page treatment of biotransformation, covering the extensive, but early work (before 1960) of Brodie, Fouts, Remmer, Burns, Conney, R. T. Williams, and others; (iii) the citation of out-dated references on reserpine (1959) and ATP (1941!); (iv) the statement that very small molecules do not have odors; (v) the elementary interpretations of Michaelis theory, which lacks mention of modifiers, nonideal multi-enzymes, and the like; and (vi) the lack of an analytical approach in distinguishing between theories (of anesthesia, for example) and solid knowledge of molecular interactions.

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Electrical Engineering

Fundamentals of Microwave Electronics. Marvin Chodorow and Charles Susskind. McGraw-Hill, New York, 1964. xiv + 297 pp. Illus. \$12.50.

This book, based on graduate courses in microwave electronics taught at Stanford University and the University of California (Berkeley), attempts to present the basic principles on which microwave devices operate, without tying the presentation to particular circuits or tubes. The authors direct the reader's attention to the simultaneous requirements and solutions of Newton's and Maxwell's equations for simple geometric configurations at the expense of circuit design details and laboriously derived field solutions for cases of complex geometry. Thus, the use of the word "fundamentals" in the title is not a misnomer, and the authors have succeeded well in their objective.

The first two chapters present a brief summary of the types and properties of microwave tubes and of the production and maintenance of electron beams. Chapters 3 and 4 deal with velocity modulation, energy exchange between the electron beam and the radio-frequency field, and the effects of interaction between electrons—that is, space charge effects. Chapter 5 derives Llewellyn's equations by considering the detailed electron motion, including space charge, for the case of the plane-parallel diode. Chapters 6 and 7 consider the interactions between the electron beam and forward-moving and backward-moving traveling waves, using first a transmission line approach and then the method of normal modes to obtain the conditions of wave propagation and amplification. In the final three chapters the authors evaluate the significance of two-dimensional motion of the electrons in the beam, coupling between the beam and the traveling electromagnetic field, electron motion in crossed-field devices, and amplification in the small-signal approximation for planar crossed-field tubes.

The book is not without its flaws, but they are relatively minor in nature. For example, Poisson's equation is introduced without defining all the symbols. This is hardly likely to cause confusion to graduate engineers, but all other symbols used throughout the book are appropriately defined when first used. Another example, which will