gest possible uses for this source book as a teaching aid or for use by the student who is studying on his own. I sincerely hope to see the day when I can submit these reprints, or any other comparable set of research papers, as a reading assignment to first-year chemistry students. It is exactly in such a context that we cannot but wonder how much more useful a publication of this type would be if supplemented with, say, 50 pages of accompanying text.

The text should not only provide a preface to, and critical summary of, what is presented in the present volume, but also contain appendices clarifying many features that of necessity had to be compressed in the research papers involved. Finally, a survey of the related work of other authors, merely referred to in Platt's preface, would be very much apropos here (particularly the later developments due to H. Kuhn). In the meantime we can only hope that the publication of this "source book" will create renewed and broader interest in this beautiful method of quantum chemistry. Perhaps this will help point toward the need for a true and comprehensive textbook on free-electron theory.

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Paleontology

Colloque sur le Paléogène (Bordeaux, September 1962). Mémoires du Bureau de Recherches Géologiques et Minières, No. 28. vols. 1 and 2. Éditions Technip and Éditions B.R.G.M., Paris, 1964. vol. 1, xvi + 544 pp.; vol. 2, iv + 563 pp. Illus. Paper, F. 240.99; cloth, F. 270.

The publication of Lyell's *Principles of Geology*, 1830 to 1833, was one of the outstanding milestones in the development of the science of stratigraphy. Since that time changes in the concepts, methods, and techniques have been produced at an ever increasing tempo. Unfortunately much of the development has been haphazard, and many cherished ideas have "grown like Topsy," with little discipline apparent in their establishment and acceptance.

In the third volume of his work, Lyell subdivided the Tertiary into four periods (nowadays usually ranked as *epochs*): Eocene, Miocene, Older Pliocene, and Newer Pliocene. Later Pleistocene was substituted for Newer Pliocene. Lyell expressly provided for the intercalation of new periods, and subsequently Beyrich created the Oligocene and Schimper the Paleocene to complete the usually accepted sequence. The types (all in western Europe) of these periods were not indicated with a precision suitable to present day needs and their limits were vague, but they form the standard with which the sequences of other parts of the world are sooner or later compared.

Two decades after Lyell's book, Alcide D'Orbigny proposed other stratigraphic subdivisions, which he termed *étages*, or in English, *stages*. Subsequently modified in concept and refined, the stages of the Tertiary have subsequently usually been ranked as subdivisions of Lyell's periods. Since then proposed stages have proliferated apace, especially within the Tertiary, and often, until relatively recently, with little discipline. Many have as rapidly passed into limbo; some have had only local use, but others have been utilized on a worldwide basis. Modern analyses and needs have brought to light many contradictions, inconsistencies, and inadequacies in the definitions and usages and hence emphasized the need for worldwide agreement on stratigraphic standards and interpretations. The Colloque sur le Paléogène, held at Bordeaux in September 1962, is one of several noteworthy attempts in recent years to improve the situation for the Tertiary; the present volumes represent the results of that gathering.

The 1107 (+ xvi + iv) pages (the review copy has paper covers and a weak back) include 102 separate papers, a terminal table of contents listed alphabetically by senior author, and an introductory table of contents in which the papers are classified according to various categories. There is no general introduction giving the purpose of the conference, no listing of participants, nor any general index. It is thus exceedingly difficult to locate considerations of specific subjects, places, or individuals. A little more editorial care would have made these meaty volumes much easier to utilize and thus better serve the purposes of the conference. The first set of papers is concerned with the following areas: the Paris Basin (169 pp.); the Aquitaine Basin (307 pp.); other parts of France (63 pp.); the Nordic Basin (52 pp.); Mediterranean and Alpine areas (142 pp.); the U.S.S.R. (84 pp.); Africa (28 pp.); and Greenland (4 pp.). Papers on boundary problems of the Paleogene occupy 66 pages. Forty-six pages are devoted to consideration of new and better ways of subdividing the Paleogene. Paleontological papers take up 108 pages. In the final 28 pages the sedimentary facies of the Montian of western Europe are considered.

As in all gatherings of this sort, the participants were of diverse calibers, training, and viewpoints, and the resulting papers represent various degrees of scholarliness and preparation. In consequence, no matter what his philosophy or background, a user will find something of which he will approve or disapprove. However, one thing is certain: anyone attempting to correlate with the "standard" sections in Europe, or to use them as a standard, should consult these volumes.

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Chemical Propellants

Energetics of Propellant Chemistry. Bernard Siegel and Leroy Schieler. Wiley, New York, 1964. xiv + 240 pp. Illus. $10.

This new addition to the rapidly growing library of texts on rocket propellants and propulsion is simply, if not too efficiently, organized. The authors begin with a discussion of the basic principles of propulsion and methods of calculating the performance of propellants (chapter 1). The energetics of propellant combustion products (chapter 2) and of propellant reactants (chapter 4) are considered individually but with the common theme of the fundamental role played by molecular bonding. The behavior of the combustion products as a working fluid with dissociation-limited temperature is discussed in chapter 3. This background is fused into a treatment of actual, or at least possible, propellant systems in chapter 5. Such an organization inevitably leads to considerable repetition which sharper editing could have reduced. For example, the outline of the book is given in the preface, in the last paragraph of chapter 1, in the first paragraph of chap-

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 multienzymes, 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