respect to molecular geometry and thermodynamic stability. The diversity of descriptive chemistry, however, does require some skeleton on which to hang the meat of the matter. This chapter will serve as an excellent aid in learning and remembering facts of chemistry. Considering that so much of the present literature is devoted to explaining stability and structure in simple terms, it seems quite appropriate that this volume include a chapter such as this one.

"Metallocenes" by William F. Little.—In contrast to the chapter by Professor Rundle, this chapter is devoted almost entirely to the preparation and chemical reactions of ferrocenes and other metallocenes. There is little doubt that the metallocenes form one of the most interesting chapters in modern inorganic chemistry and have served to stimulate much novel inorganic synthesis and thought concerning chemical bonding. This chapter, together with that of Rundle, presents the reader with a considerable (and contrasting) discussion of transition metal chemistry.

"Oxidation Reduction Mechanisms in Organic Chemistry" by Kenneth B. Wiberg.—There is a large body of systematically gathered data on the oxidation–reduction chemistry of organic compounds. Professor Wiberg presents a well-organized classical mechanistic discussion of a goodly section of this area. The article is well flavored with the difficulties of deciding likely mechanisms and also of the modes of resolution of these difficulties. The presentation is by highly specific example and is crisp. The article serves the avowed purpose of this book splendidly.

"The Chemistry of Biological Energy Transfer" by William B. Jencks.—This chapter is certainly the grandest of the collection in area of material. The amount of material covered is vast, and yet much detail is included. This is not a chapter which can be skimmed profitably. The reading is difficult and certainly requires a reasonable working knowledge of the details of chemistry. In view of what the author attempts (and succeeds in), it could not be otherwise. The content of the chapter is just what the title says. One cannot be other than deeply impressed by the depth of chemical understanding of metabolic processes available today. In summary, this chapter is to this reviewer, the most valuable of the collection.

"The Structure of the Grignard Reagent and the Mechanisms of Its Reactions" by Rudolf M. Salinger.—The historical and practical importance of the Grignard reagent is well known. It would seem likely that by now the structure of the Grignard reagent would also be well known. The present chapter shows the latter not to be the case. The difficulties of the determination of molecular geometries in solution are seen clearly in this chapter. The first part of this work shows that even the molecular units present in solution are quite uncertain and quite likely to vary with solvent, halide, and aryl or alkyl groups. The second part of this chapter discusses the mechanisms of reactions in terms of detailed transition-state structures. In view of the difficulties in ascertaining the structure of the Grignard reagent itself, these transition state structures seem of dubious permanent value. It would seem to this reviewer that systematic studies of polymerization of magnesium halides, and of magnesium dialkyls and diaryls would be the first step in understanding the solution composition. The question of whether the species RMgX exists and is "the" Grignard reagent is obviously the basic question.

In summary, there is a considerable range in the quality of the articles presented. Some will have a relatively long life of usefulness. Considering the purpose of this series it seems fair to consider it a modest success.

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Catalysis and Inhibition of Chemical Reactions. By P. G. ASHMORE, Lecturer in Physical Chemistry, University of Cambridge, Fellow and Tutor of Churchill College. Butterworth, Inc., 7235 Wisconsin Ave., Washington, D. C. 20514. 1963. 375 pp. 16 × 25.5 cm. Price, $14.95.

In the preface to this book the author states that he has ". . .chosen as wide a definition of 'catalysts' as allowed in order to compare and contrast mechanisms. . . ." Such a goal requires coverage of a wide variety of reactions, and in this respect, the book lives up to its promise. The discussion ranges from thermal decomposition to polymerization—from proton and electron transfer in solution to atom transfer in gas reactions—from heterogeneous catalysis to enzyme catalysis. These topics are developed in some depth as attested by the 900 references at the chapter ends. Thus, here we have a book that should be of particular interest to researchers in one of these areas who seek to broaden their outlook as well as (to quote the author) "students of all branches of chemistry."

Books written for specialists can be effective even when terms and concepts are unclearly presented so that familiarity with the literature is required for understanding, but a summary for nonspecialists must be clear. In this respect the book falters. Clarity is sometimes lost because of muddy presentation. For example, in his discussion of adsorption on heterogeneous catalysts the author observes: "The specific effects of crystal face may also be due to the possibility *or otherwise* of multiple bonding of an atom to several surface atoms." (Italics are mine.) In the same chapter he also observes: "Some recent evidence (see p. 139) suggests that the pattern of sites may be *between* the surface atoms at low coverage, but changing to the surface atoms at higher coverage[3]." On page 139, there is no elaboration on this statement, nor is the evidence revealed. Furthermore, the reference cited is a 35-page review article on chemisorption of metals with 125 references.

In some sections the author sacrifices precision for brevity. This is most distressing in his discussion of the kinetics of polymerization kinetics where he uses m_j^* to indicate a radical chain with j segments; then, without redefinition, he (apparently) uses the symbol $[m_j^*]$ to represent the *total* concentration of *all* radical chains. Such lack of precision also appears in the running text. For example, in this same chapter he states that activation energies obtained by different workers for the same reaction are "not very different"; in the accompanying table we find that different workers report 0 and 5.2 kcal./mole for the same reactions.

Finally, the density of typographical errors seems higher than usual. True, some of these are trivial, but some are troublesome.

In evaluating any book, the good points must be weighed against the bad points. On the plus side, we find a variety of reactions presented in considerable depth; on the minus side, we find the defects mentioned in the preceding paragraphs. In the balance, the book is a valuable reference in spite of its defects. But without these defects, it would have been outstanding.

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Indolalkaloide in Tabellen. By MANFRED HESSE, Assistent am Institut fur Organische Chemie der Universitat Zurich. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf (West), Germany. 1964. 212 pp. 21 × 29.5 cm. Price, DM 24.

Indole alkaloids have been in recent years the subject of extensive investigations in different laboratories throughout the world. This has been the result of the discovery of remarkable physiological properties of various representatives of this class of natural products such as reserpine, lysergic acid diethylamid, and, more recently, vincaleukoblastine (VLB), a useful therapeutic agent in the treatment of human neoplasms. According to Manfred Hesse, the author of the newest catalog of indole alkaloids, an average of eight new indole alkaloids appeared monthly in the literature in 1963. In this era of structure elucidation by mass spectrometry and X-ray method, it is hard for a standard textbook on alkaloids to keep up with the new findings. This is one of the reasons why Hesse's Tables will certainly be a most useful catalog for all those who are working in this field.

Hesse's Tables contain data on 511 alkaloids. At the time of printing, the structures of 304 of these were known. Alkaloids are listed in groups according to certain types, such as Olivacine (I), Canthine (II), Iboga (III), Aspidosperma (IV), etc. A great virtue of the Tables lies in the presentation and placing of the various data to the right of the structure. Each position (occurrence; structure determination; melting point; optical rotation; infrared, n.m.r., mass, and ultraviolet spectra; and synthesis) is accompanied by a reference number, with references to be found on the bottom of the same page. Only those who assemble this type of data can appreciate the enormous amount

of literature searching involved in locating some of the data, especially when two identical compounds are reported independently by different investigators using different instruments. Hesse's arrangement deserves special comment since it makes it so convenient to find all constants together without having to look through several pages in order to find the Roman number accompanying the structure needed.

The merits of the compilation overshadow some errors which have been noticed. For instance, in the group of ajmaline alkaloids, Bartlett and co-workers [*J. Am. Chem. Soc.*, **84**, 622 (1962)] have shown that the ring B of ajmaline is *cis* fused to the chair piperidyl moiety, not *trans* as shown in the structure of ajmaline on page 71 and sandwicine and isoajmaline on page 72. The structure of quebrachidine on page 72 is correct (*trans* ring fusion of ring B and piperidine moiety).

The author is to be commended for having undertaken to compile all the data. It is hoped that this volume will be followed by a revised edition in order to keep up with the ever increasing number of publications in the area of indole alkaloids.

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NORBERT NEUSS

Spectroscopy and Molecular Structure. By GERALD W. KING, McMaster University. Holt, Rinehart and Winston, Inc., 383 Madison Ave., N. Y. 1964. xiv + 482 pp. 16 × 23.5 cm. Price, $10.75.

There are many excellent texts on quantum mechanics which discuss a few applications to problems of spectroscopy. There are also several authoritative, but specialized volumes on spectroscopy. There are also several authoritative, but specialized volumes on spectroscopy. However, a well-balanced and self-contained treatment of the two closely connected areas has not been available in a text suitable for graduate students in physical chemistry. The present text should satisfy this need.

The quantum mechanical treatment is necessarily selective, with a concentration on interpretation, but the limited discussion is not superficial and forms an adequate background for the understanding of complex spectra. The theoretical treatment (Chapters 8 and 9) of rotation and vibration in polyatomic molecules is especially clear and concise. The theory of electronic spectra is less satisfying. Perhaps the treatment here is too concise, and a considerable amount of outside reading will be required to understand the many difficult topics which are included. The detailed illustrations chosen certainly are of current interest, but some appear rather sophisticated and may lead to some confusion to the beginner. However, the references are carefully chosen and will stimulate further reading. It is believed that the text serves admirably the purposes stated by the author, and the book is highly recommended to all who are interested in the fundamentals of spectroscopy.

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Concepts in Photoconductivity and Allied Problems. By ALBERT ROSE, RCA Laboratories, Princeton, N. J. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 168 pp. 14.5 × 21 cm. Price, $5.95.

This book presents a phenomenological view of photoconductivity in solid materials. It attempts explanation of not only the simpler, but also some of the more complex aspects of photoconductivity in terms of a limited number of concepts. Primary among these concepts are those of trapping and recombination centers as differentiated by steady-state Fermi levels and demarcation levels. Within its restricted scope the treatment does attain some success. The most regrettable omissions are: the topics of carrier generation, carrier mobilities, scattering processes, and transport properties generally.

The subject of trapping and recombination has been dealt with in considerable detail, and, in fact, the discussion of Chapters 2 and 3 is by far the most lucid, informative, and credible of the book. The models have been chosen well, and ultimately lead one to a system having a distribution of states throughout the forbidden zone. Many fundamental facts, such as the equality of lifetimes of both carriers, the nonrelation of temperature dependencies of semiconductivity and photoconductivity, etc., are emphasized, and the semiconductor–insulator transition is discussed clearly.

Chapter 3 must be contrasted with Chapter 9. This latter chapter, which is concerned with the energy levels of solids and electrolytes, eschews quantum mechanics and justifies its existence because, in the author's words, "the concepts are simple and provide a useful guide for exploratory work." This reader cannot agree. Vague, nonmathematical concepts are not simple; indeed, they are usually complex and frequently ambiguous. Furthermore, it is difficult to conceive of an association between ambiguity and utility, unless it be of an inverse nature.

Chapter 4 is concerned with space-charge-limited current flow and constitutes a good discussion. Chapter 5 discusses the gain-bandwidth product in a succinct fashion, and is marred only by the use of terminology which the book makes no pretense to define.

Chapter 6 discusses noise currents, and Chapter 7 provides a short discussion of capture cross sections. Both chapters are interesting, and probably do present some physical insights; on the other hand, they are overly heuristic and this reader did not find them useful.

Paper, typography, and binding are of reasonably good quality. Typographical errors have been found in equations 2.12 and 3.12, the caption of Fig. 5.3, and on pages 33, 66, 80, 120, 121, 135, and 154. There is a minor inconsistency between equations 3.32 and 3.33, and a constant is neglected in one of the equations (4.25).

A number of hypothetical models have been proposed to explain various types of behavior. Experimental results typifying all such behaviorisms are lacking in reference, and it is not possible to decide on the general validity of the proposed models. This is not a fault of the book since it makes no pretence to a description of experiment; this latter fact, however, implies that the book will not serve as an introductory reader. Indeed, it would not be going too far to assert that the present volume and that of Bube (R. H. Bube, "Photoconductivity of Solids," John Wiley and Sons, Inc., New York, N, Y., 1960) are largely complementary. Both books are valuable in that together they point out very well the present lack of understanding of the field of photoconductivity.

The average physical chemist will have no difficulty in reading this book; he probably will not want to do so unless he is engaged in or associated with photoconductor research. It presents a good, although uneven, summary of the phenomenological point of view, its strengths and its weaknesses; it will probably convince the reader that there must be a more satisfying way of understanding the various aspects of photoconductivity.

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Colorimetric Determination of Elements. Principles and Methods. By G. CHARLOT, Professor of Analytical Chemistry, Faculte des Sciences, Ecole Superieure de Physique et de Chimie Industrielles, Paris. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York 17, N. Y. 1964. ix + 449 pp. 17.5 × 25 cm. Price, $18.00.

This book is an English translation (by the Express Translation Service, London) of the second French edition of 1961. Some sections of the latter have been revised for the English edition. The book consists of two parts. The first, comprising a little more than a third of the whole, deals with the theoretical foundations of colorimetry and spectrophotometry and with principles of separation. The second part is a compilation of selected methods of separation and colorimetric determination of approximately 65 elements. The treatment tends to be condensed, *e.g.*, six pages for aluminum, three and one-half for beryllium, six for sulfur, three for the rare earths, and five lines for hydrogen.

The chief usefulness of the book probably lies in its unitary survey of a rather wide field, sections of which have received fuller treatment in a number of earlier books. It contains compara-