

For instance, it hardly seems appropriate to devote 8 pages (pp. 523–530) to the principles of conformational analysis, beginning with a reference to Van't Hoff in 1875. There appear to be few errors, but one mistake concerning the total synthesis of the oleanane carbon skeleton (p. 637) was noticed. The first synthesis was not carried out by Barltrop, *et al.*, in 1962, but by Corey, *et al.*, in 1959 [*J. Am. Chem. Soc.*, **81**, 5258 (1959); **85**, 3979 (1963)].

The above criticisms are minor ones, and the book can be recommended warmly. It will be found invaluable to all who are interested in triterpenoids, either from a chemical or a biological point of view. It is unfortunate that the very high price will restrict the number of scientists who will be able to purchase the book for themselves.

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Les Mécanismes Réactionnels en Chimie Organique. By BIANCA TCHOUBAR, Directeur de recherches au C.N.R.S. Dunod, 92, rue Bonaparte, Paris, France. 1964. xvi + 231 pp. 11 × 17 cm. Price, 18 F.

Chemical education in France—the home of Dirac and de Broglie—has long segregated the principles of quantum chemistry from the more mundane science of organic chemistry. This little book is a modest effort to bridge the gap between these disciplines at the undergraduate level. More properly to be titled, “An Introduction to Reaction Mechanisms in Organic Chemistry,” this pocket-sized volume attempts to survey and classify the processes of organic chemistry in terms of current concepts of the electronic structure of molecules. The first four chapters deal concisely with orbital hybridization, bond polarity and polarizability, conjugation energy, inductive and mesomeric effects, modern concepts of acidity and basicity, and related topics. The treatment is predominantly qualitative, reflects the Ingold influence, and is well illustrated by clear and simple diagrams. The remaining nine chapters include a short but excellent introduction to chemical kinetics and the transition state, followed by surveys of aliphatic substitution reactions, eliminations, additions to olefins, prototropic processes, reactions of carbonyl groups, and aromatic substitution. These necessarily brief surveys are well supplemented by an appendix referring the reader to selected review articles dealing with the key reactions of each class.

The linguistic style of the author is lucid and straightforward; indeed this reviewer recommends the volume to all those who would learn “chemical French” painlessly. The typography and flexible cloth binding are exceptionally attractive. From the scientific standpoint the presentation is essentially sound and up to date. Such subjects of relatively recent interest as the reactions of enamines, arynes, n.m.r., multiplicity of carbenes, and the stereochemistry of carbanions are touched upon in greater or lesser detail. The book does contain a few curious statements which carry unfortunate implications, *e.g.*, that pinene has a conjugation energy of 13 to 14 kcal., that electron delocalization is always more important in a cyclic conjugated system than in the corresponding acyclic system, that demonstration of fast deuterium exchange by a halogenated substrate proves a carbanion mechanism (as opposed to an E2 mechanism) for elimination from that substrate, and that “thermal or photochemical excitation transforms a singlet carbene into a biradical (triplet).” One would also hope for more thorough literature referencing of the various experiments and statements cited in the text. On balance, however, this is a competent little work, and although its use in the theoretically oriented U. S. chemical curriculum would appear limited, one might foresee considerable interest among undergraduates overseas.

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Solvay Institute 12th Chemistry Conference. Energy Transfer in Gases. Edited by R. STOOFS, 76–78, Coudenberg, Brussels, Belgium. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1964. 554 pp. 18 × 26 cm. Price, \$15.00.

This volume presents the week-long discussion of energy transfer between molecules in collision by many of the foremost experts in this field. Chemical kinetics, ordinary unimolecular gas reactions,

flash photolysis, chain reactions, and collision theory were discussed. These subjects were followed by reports on shock tube kinetics and electronic excitation, energy exchange in detonation, molecular beams, mass spectrography, and vibrational energy relaxations, and some remarks were made on scattering theory. The following authors are responsible for the chapters: A. R. Ubbelohde, O. K. Rice, R. G. W. Norrish, N. N. Semenov, E. P. Wigner, A. Kantrowitz, A. G. Gaydon, D. F. Hornig, T. L. Cottrell, J. Ross, and E. F. Greene, J. D. Morrison, V. N. Kondratiev, and I. Prigogine. This list should be sufficient guarantee of the high quality of the material presented.

The book contains a surprising number of misspelled words which, however, leads to no special difficulty. The book is well put together and reasonably priced for these times.

One cannot but be impressed with the many new methods for measuring energy transfer and with the effort going into the theoretical calculations which we find summarized here. Collision theory is the growing edge of reaction rate theory and this book provides a welcome review of this important field.

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Crystal Structures. Second Edition. Volume 2. Inorganic Compounds, RX_n , R_nMX_3 , R_nMX_3 . By RALPH W. G. WYCKOFF, University of Arizona, Tucson, Ariz. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1964. vii + 588 pp. 15.5 × 24 cm. Price, \$24.00.

“The author of the volume under review already has an enviable reputation for his brilliant research in developing the science of crystal structure analysis in this country and for his earlier volumes on “The Structure of Crystals,” as well as for his more recent ultracentrifuge and electron microscope studies of proteins and other biological substances. This new publication is sure to increase his reputation still more.

“It is a magnificent work, describing, illustrating, classifying, and comparing the crystal structures of all elements and compounds of known structure. . . .

“The reviewer recommends this book highly as a reference work to all chemists and physicists interested in the properties of solid matter and their correlation with structure.”

The foregoing comments are from the writer's review¹ of Section I of the first edition of Wyckoff's “Crystal Structures.” They are equally applicable to the Second Edition.

The first edition was published in loose-leaf form, with supplements issued from time to time to keep it more nearly up to date. With the rapid expansion of the literature in this field, however, the difficulties of inserting the new material into the proper places among the old pages and of proper indexing made the loose-leaf system unsatisfactory. The second edition is therefore being published in the usual book form. It is to be hoped that the remaining volumes will be rapidly forthcoming and that revisions will appear at frequent intervals.

Volume 1 covered the elements and compounds having formulas of the RX and RX_2 types. Volume 2 covers other inorganic compounds of the R_nX_m class, also $R(MX_2)_n$ and $R_n(MX_3)_p$ compounds. The literature has apparently been thoroughly (and critically) covered through 1961 and a part of 1962.

Except for some intermetallic compounds, the author attempts to report all structures for which the atomic positions (usually excluding hydrogens) have been determined. Dimensions and symmetries of the unit cells and coordinates of the atoms are given, using the terminology and conventions of the “International Tables for X-Ray Crystallography.”² Some interatomic distance data are included and there are occasional discussions of bond distributions and other structurally interesting or important facts. For more information of this sort, the reader must go to the original papers or to their abstracts, published in the “Strukturbericht”³ and its successor, “Structure Reports.”⁴ It may be noted that although there is much overlapping between “Crystal Structures” and “Structure Reports,” the latter are essentially abstract vol-

(1) M. L. Huggins, *J. Chem. Educ.*, **26**, 289 (1949).

(2) “International Tables for X-Ray Crystallography,” Kynoch Press, Birmingham, England, 1952, 1959, 1962.

(3) P. P. Ewald, *et al.*, “Strukturbericht,” Akademische Verlagsgesellschaft m.b.H., Leipzig, 1931–1939.

(4) A. J. C. Wilson, *et al.*, “Structure Reports,” Oosthoek, Utrecht.

umes, each volume attempting to give critical abstracts and discussions of all crystal structure research reported in a given year. The bibliography in "Crystal Structures" is excellent, but it would be even more useful if references were given, wherever possible, to the corresponding abstracts in "Structure Reports."

Wyckoff makes no attempt to discuss the significance of the structures he reports with regard to the principles determining the stabilities of different structure types, the factors determining the dimensions (interatomic distances, bond angles, etc.) occurring in different compounds, or relationships to the properties of the substances. These subjects have of course been dealt with by others, usually in very limited areas, and it is to be hoped and expected that "Crystal Structures," with the help of "Structure Reports" and "International Tables for X-Ray Crystallography," will serve as a good basis for further research and publication along these lines. It is the writer's opinion that the determination of crystal structures is worthwhile only as a step toward a better understanding of the principles of atomic and molecular interactions and the relationships between the composition and the properties of substances.

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Advances in Organometallic Chemistry, Volume 1. Edited by F. G. A. STONE, Professor in the Department of Inorganic Chemistry, Bristol University, and ROBERT WEST, Professor of Chemistry at the University of Wisconsin. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. 1964. xi + 344 pp. 15 × 23 cm. Price, \$11.00.

"Interdisciplinary" has been a popular adjective of late, and we might think of organometallic chemistry as the original interdisciplinary field of our science. For a long time it suffered as a stepchild because it seemed to belong neither here nor there, but quite suddenly (as the editors of the present volume point out) the discovery of entire classes of compounds which possess remarkable structures brought the subject into the foreground, and these compounds stimulated a new and more thorough look at the theoretical nature of carbon-metal bonds in general. At the same time, organometallic substances became important in more and more industrial processes, which is always a good omen for the development of any branch of science. Professors Stone and West now see organometallic chemistry as "a convergence of inorganic, organic, and physical chemistry where the respective disciplines can benefit by interaction with each other," and the present volume represents the first of an ambitious series of reviews in which they hope to cover all recent developments in the science of substances containing organic groups bonded to metals.

Volume 1 cannot embrace all of organometallic chemistry, of course, but presents six reviews of specialized but timely topics. The first of these is a review of diene-iron carbonyl complexes and related species by R. Pettit and G. F. Emerson of the University of Texas, in which they take up the structures and spectra of complexes of butadiene and many other dienes and trienes with the several iron carbonyls; compounds of the iron carbonyls with acetylenes are also included. The second contribution is concerned with reactions of organotin hydrides with organic compounds and is written by Henry Kuivila of the University of New Hampshire; it takes up the preparation and properties of organotin hydrides and then considers their additions to alkenes and alkynes and their reductions of aldehydes, ketones, halides, and related substances. The third contribution is on organic substituted cyclosilanes, by Henry Gilman and Gerald L. Schwebke of Iowa State University, and covers the preparation of a great variety of cyclic substances built upon Si-Si bonds, together with their reactions with metals, hydrogen, halides, and oxidizing agents. The fourth review is devoted to fluorocarbon derivatives of the metals and is written by P. M. Treichel (now at Wisconsin) and F. G. A. Stone. This field is developing very rapidly and the authors are hard put to cover all of the derivatives of the representative and transition metals in terms of their preparation, reactions, structures, and spectra, but they do it and do it extremely well. The fifth contribution, concerning conjugate addition of Grignard reagents to aromatic systems, by Reynold C. Fuson, will seem like classical organometallic chemistry applied to organic synthesis to many older readers, but with many a new twist. The sixth article, on infrared and Raman spectral studies of π -complexes formed between metals and C_nH_n rings, by Heinz Z. P. Fritz of the Inorganic

Institute of Munich, deals with the theory and techniques of such spectral studies and then summarizes the experimental results for three-, four-, five-, six-, seven-, and eight-membered rings associated with metal atoms. Each article is followed by 150 or so references, and the book also has a complete author and subject index of very respectable dimensions.

This book will be a revelation to those who have not kept up with organometallic chemistry, and a very real timesaver for those who try to keep abreast of the field. It shows purpose and judgment in the selection of articles, and it has enough uniformity of style and organization in the separate presentations to give it real continuity.

Some will object to the announcement of any new series entitled "Advances in Something or Other," seemingly adding to the burden of reading every chemist has to contend with these days. But if we ask ourselves what we would do *without* such books, we see that the "keeping abreast" effort would be quite hopeless. Since we must have reviews, let them be done tenderly, carefully, and expertly, as this one is.

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Methods in Microanalysis, Volume I, Simultaneous Rapid Combustion. Edited by J. A. KUCK, Senior Research Microanalyst, American Cyanamid Co. Gordon and Breach, 150 Fifth Ave., New York, N. Y. 1964. 650 pp. 14.5 × 22.5 cm. Price, \$27.50.

The purpose of this book is to acquaint the English reader with the progress of quantitative organic microanalysis in Russia since World War II. This is done by presenting both the translation of the publications of Mirra Osipovna Korshun and her successors and several significant papers by other Russian or Czechoslovakian scientists which happened to fit into the general theme of the collection. It is very fortunate that one of the authors, Dr. Julius A. Kuck, is a microanalyst with many years of experience, and the reader can therefore be assured of the accuracy of the translations. In accomplishing their aim, Dr. Kuck and his associates have done an admirable service to those who read English but do not read Russian.

The selection of the articles translated is an obvious one, since Miss Korshun was not only the best known Russian microanalyst but also one of the world's most outstanding ones. Thirty-four of the included articles were either authored or coauthored by Miss Korshun (seven after her death), while the rest were written by well-known Russian or Czechoslovakian microanalysts. Not only is the book of value from a scientific standpoint but, as Dr. Kuck has pointed out in the preface, it shows the great value which Russian science places on research in this field and the thoroughness with which the Russians train their microanalysts in their leading university. This is in direct contrast to the growing idea which exists in America and parts of Europe that laboratory technicians, instead of graduate chemists, should perform the analyses.

In all, there are 56 articles which were originally published during the period from 1941 to 1961. Twenty-nine of them deal with simultaneous determinations of several elements in one weighed sample. Fifteen papers stress the so-called "rapid" combustion procedures in which the rates of flow of oxygen through the combustion train are between 25 and 50 ml./min. However, some of these procedures require 25 to 35 min. per combustion, and one paper states that eight to ten carbon-hydrogen determinations may be done in one working day!

The following determinations are included, either as single determinations or as simultaneous ones: carbon-hydrogen, nitrogen, oxygen, halogens (including fluorine), sulfur, phosphorus, mercury, boron, and silicon. Thirty-eight of the chapters deal directly with various phases of the carbon-hydrogen determination, and another one describes an electric heating element suitable for this determination as well as for several others. Automation, thermal conductivity, conductometric titration, errors, absorption of oxides of nitrogen, etc., are included. Ten chapters deal directly with the determination of nitrogen. The use of thermal conductivity as a means of measuring the end-product is included. Four of the articles are on the determination of oxygen, and one of them is on the advances in organic elemental analysis which was originally published in Russian in 1959.

This book will make a valuable addition to every microanalyst's library, and the authors are to be congratulated for their tremendous