

exception of the methylene portion of the ethylthio grouping which now appeared as a simple quartet centered at 173 c.p.s. ( $J = 8$  c.p.s.). The increased van der Waals radius of the sulfur atom now permits free rotation of this grouping which was restricted in the oxygen analog.

Preliminary attempts to desulfurize IIIb with various

Raney nickel reagents have not yet afforded an unsubstituted 3H-azepine.

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RECEIVED OCTOBER 31, 1963

## BOOK REVIEWS

**Comparative Biochemistry, A Comprehensive Treatise. Volume V. Constituents of Life, Part C.** By MARCEL FLORKIN and HOWARD S. MASON. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. 1963. 637 pp. 16 × 24 cm. Price, \$20.00; subscription price, \$18.50.

Volume V of this ambitious work contains six chapters which treat, respectively, of the amino acids, inorganic nitrogen compounds, organic acids, collagen, photosynthesis, and the halides as components of biological systems. Of the authors of these chapters, five are French, three Japanese, two German, one Dutch, and one American. As a result, the treatment of the several topics is decidedly international in flavor and there is no overemphasis upon American accomplishments. The bibliographies attached to each chapter are extensive, and references to little-known journals are by no means uncommon.

Except for the chapter on photosynthesis which deals exclusively with plants, and that on collagen which deals only with animals, the authors have considered the biochemical relationships of the substances they discuss over the entire field of biology. Since a great deal has been done with unicellular organisms in recent years, considerable space is devoted to them.

In the chapter on amino acids, the discussion of the twenty-two which are the common products of the hydrolysis of proteins is somewhat perfunctory and contains far too many erroneous or misleading statements. Students should not be directed to this chapter for information regarding these substances. The subject is more thoroughly and authoritatively treated in many current textbooks. However, the remainder of the chapter is valuable. It gives references to and brief discussions of no less than ninety-six amino acids that have been found in recent years either free or combined in various plants and animals, and is of great interest to anyone concerned with this somewhat esoteric field. The key references are here, and one can easily, with this information as a start, acquire all that is known today regarding such curiosities as albizziine and alline should he feel so inclined.

The three Japanese authors of the chapter on the distribution and metabolism of inorganic nitrogen compounds have prepared a thorough and authoritative review of the subject. The emphasis is naturally upon plants, especially microorganisms, since only a few single-celled organisms have the capacity to fix molecular nitrogen, and much that has been learned about the reduction of nitrate in nature has been acquired from the study of these lower forms.

The chapter on organic acid metabolism is concerned mainly with the many enzyme-catalyzed reactions which these substances undergo, and the way these reactions are linked in the metabolism of both animals and plants. The several discussions are brief, but this chapter would afford quick information concerning these reactions and is a good place to obtain the fundamental references.

The chapter on collagen is short but thorough, and is illustrated with reproductions of many beautiful electron micrographs of fibers showing details of their structure.

The longest chapter is that on photosynthesis. With its bibliography, it runs to 145 pages. Its author points out that he has of necessity restricted himself to only parts of the story, and has selected those parts that he regards as "rather closed" in the sense that this much at least seems to be securely known. He adds that a comprehensive treatment of the subject has needed upward of two thousand pages in each of two recent treatises. The outcome of his approach is an excellent discussion of the present position in this vitally important but extremely complex field. The few pages devoted to the controversial subject of the quantum yield of photosynthesis are outstanding for their measured and critical judgment.

The final chapter on halides deals briefly with the distribution in nature of chlorine, bromine, and iodine in both ionized form

and in organic compounds. A great deal of unusual information is included.

We come now to an appraisal of the book as a whole. Although well printed, the proof-reading and, occasionally, the editing leave something to be desired. The book is heavy to hold, and the binding broke during the reviewer's reading. One wonders also about the audience that this volume, as the fifth in a projected series of seven, is designed to reach. The price of the five volumes that have appeared is over one hundred dollars even by advance subscription, so that few individuals are likely to buy, the incomes of graduate students and professors being what they are in most cases. The matter then reduces to the question whether the set is essential in the department library as a reference and for assigned reading. The answer to this question must be sought by the heads of interested departments.

THE CONNECTICUT AGRICULTURAL  
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**Nouveau Traité de Chimie Minérale.** Professeur M. HAISSENSKY avec la collaboration de M. P. FAUGERAS, Mlle. C. FERRADINI, M. H. FRANCOIS, Mlle. M. HEUBERGER, Mme. M. PAGES, M. R. PLASCARD, and Mme. C. PEREBASKINE-COURTEVILLE. Published under the direction of Paul Pascal, Masson et Cie., 120 Boulevard Saint-Germain, Paris VI, France. 1962. L + 1090 pp. 17 × 26 cm. Broché, 180 NF., cartonne toilé, 192 NF.

Section III of Volume XV of the monumental "Nouveau Traité de Chimie Minérale" is entitled "Transuraniens," but about one-hundred seventy pages are devoted to nuclear and radiochemistry and sixty to a discussion of various aspects of the problem of contamination of the atmosphere by artificial and natural radioactivity.

Because of the large number of individual subjects which are covered in these portions of the book, the treatment of each necessarily is largely qualitative and superficial.

To illustrate, about two-hundred words are devoted to the effects of radiation in accelerating phase changes in solids, about two-hundred fifty to the Bohr-Mottelson collective model of the nucleus, a page to photonuclear reactions, and so on.

Students approaching the field of nuclear chemistry for the first time no doubt will be fascinated by the many facets of the subject which are revealed by Professor Haissinsky's survey.

The bulk of the book is devoted to the physical and chemical properties of the transuranium elements. Here the coverage is comprehensive, the organization logical, and the treatment highly lucid. The literature has been thoroughly examined up through 1960, and two addenda dealing with the discovery of lawrencium and with the properties of the transuranium metals, respectively, include work published in 1961.

No other single volume now available compares with this in comprehensiveness of coverage of published data on the chemical, metallurgical, and physical properties of the transuranium elements.

One notes that more than five hundred pages are devoted to plutonium alone, as compared with less than one hundred in Katz and Seaborg's "The Actinide Elements."

One can only feel grateful to Professor Haissinsky and his collaborators for their heroic effort in compiling and correlating so much information.

It is not to be expected that such a vast amount of data could be transcribed without error, but in fact such errors are surprisingly few. Of course, any reader seriously interested in using a datum from this or similar compilations should check the original source.

For a number of years Professor Haissinsky has been a vigorous and consistent opponent of the actinide concept of the heavy

element series, which he prefers to divide into uranides (uranium through americium) and curides (curium through lawrencium). His arguments for so doing are given in detail in the chapter entitled "Les Transurauraniens."

In large part this controversy reduces ultimately to personal preferences in matters of nomenclature, and hence lies outside the area of logical debate. Where it is a question of the interpretation of experimental evidence the correct interpretation no doubt will ultimately be made clear.

Whatever the faults of this book, they are very minor in comparison with its merits as a comprehensive and up-to-date reference on the physical and chemical properties of the transuranium elements.

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B. B. CUNNINGHAM

**Chemistry of Combustion Reactions.** By G. J. MINKOFF, D.Sc., Ph.D., D.I.C., B.P. Research Centre, B.P. Chemical Co., Ltd., Sunbury-on-Thames, and C. F. H. TIPPER, D.Sc., Ph.D., Senior Lecturer, Department of Inorganic, Physical and Industrial Chemistry, University of Liverpool. Butterworth Inc., Medicinal and Scientific Publishers, 7235 Wisconsin Avenue, Washington 14, D. C. 1962. xii + 393 pp. 17 × 25.5 cm. Price, \$14.95.

This treatise attempts to provide a general picture of the knowledge of the chemistry of combustion and flame reactions. Part I deals with the oxidation reactions of hydrogen and carbon monoxide; general experimental techniques and observations are described and followed with detailed discussions of the mechanisms and important radical intermediates. Part II is devoted to a discussion of the gas phase oxidation of organic compounds. A chapter is devoted to consideration of experimental methods, chiefly to outline problems and limitations on the validity of extant data for these complex systems. Succeeding chapters in this part describe results obtained and possible and probable mechanisms for slow combustion of aldehydes and hydrocarbons, oxidation of substituted hydrocarbons, and cool flames and ignition phenomena. Part III, almost half of the book, concludes with a treatment of high-temperature combustion, in which mass and energy transfer processes further complicate the chain reactions considered in Part II. The experimental approach is stressed in this part "to avoid being drawn into premature controversies which will eventually be resolved." Modern spectroscopic and sampling methods are well represented. Studies of energy relaxation and kinetic studies in nonflame systems are included because of pertinence to combustion systems. Chapters are found discussing high temperature pyrolysis of hydrocarbons and derivatives, combustion in stationary flames, and recombination reactions. The literature survey seems to have been broad and reasonably complete through 1960 with many references to 1961 papers in some chapters and a few 1962 references. There are numerous references to the Russian literature. This book is to be highly recommended for those interested in the chemical aspects of combustion reactions.

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JOHN P. CHESICK

**Entropy. The Significance of the Concept of Entropy and its Applications in Science and Technology.** By J. D. FAST, Chief Metallurgist, Philips Research Laboratories, and Professor at the Technical University, Eindhoven, the Netherlands. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1962. xii + 313 pp. 16 × 23.5 cm. Price, \$10.75.

In recent years, courses in physical chemistry have been upgraded to the point where the elements of thermodynamics are comprehensively discussed. This creates a problem in the choice of subject matter for the traditional senior or graduate course in thermodynamics. One may, on the one hand, cover the same material in a more rigorous manner, or, on the other, depart from the traditional by extending the graduate course to include an introduction to statistical thermodynamics and to irreversible thermodynamics. If one's choice is to include statistical thermodynamics, one should give serious consideration to this excellent book by Professor J. D. Fast as a text book or for supplementary reading.

The subject matter covered in the book is limited so that it cannot be considered a monograph on "Entropy," but it is more extensive than most books on thermodynamics which contain a section on statistical thermodynamics. In addition to the material usually covered in an introductory text, this book contains much that is not, e.g., paramagnetism, interstitial atoms in metals, substitutional alloys, ferromagnetism, vacancies and dif-

fusion in solids, elasticity of rubber, polymer solutions, radiation thermodynamics, fuel cells, and heat pumps.

The author introduces each section with a lucid statement of the problem at hand, follows this with a pictorial description of the solution, and finally with a more exact mathematical treatment with all approximations clearly spelled out. In almost all instances he supplements the discussion with numerical examples which give the reader an excellent idea of the order of magnitudes of the quantities involved.

The various topics discussed in this book are uniformly well treated. Chapter 1 is concerned with classical thermodynamics and contains sections on the second law, Carnot cycles, and the concept of temperature which are outstanding for their clarity. Chapter 2 introduces one to the statistical concept of entropy and discusses the specific heat of an Einstein solid and the vibrational specific heat of gases. The choice of the Einstein solid seems to this reader pedagogically wise since its treatment is mathematically simple and at the same time yields practically all the properties of a real solid. The failure of the model at low temperatures is pointed out and is followed by a description of the improved Debye model without presenting the mathematical detail for this model.

The application of the concept of entropy is discussed in Chapter 3. After a classical presentation of the free-energy concept and chemical equilibrium, the author considers the problem of paramagnetism and the production of low temperatures in sufficient detail so that the methods introduced serve as a basis for the treatment of the remaining topics in the chapter. These topics have already been enumerated above (second paragraph).

Quantum mechanics and statistics as treated in Chapter 4 begin with Heisenberg's uncertainty principle, Schrödinger's equation, and the problem of the particle in a box. The presentation is clear, concise, and yet more detailed than that given in other books of this type. The discussion of Bose-Einstein, Fermi-Dirac, and Maxwell-Boltzmann statistics as well as their comparisons which follow is exceptionally good. The chapter ends on the subject of electrons in solids.

The last two chapters, 5 and 6, are devoted to the entropy of monatomic and diatomic gases. The material covered is the usual, but one must again comment that the treatment is clear, concise, and more detailed than the usual.

It should be obvious from the above that this reader has enjoyed this book, and while exception might be taken to a few points in the text, these are trivial when considered in the light of the whole book. Professor Fast's book is strongly recommended for chemists, metallurgists, and writers of text books. It could well serve as a model for the latter.

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**Progress in Medicinal Chemistry. Volume 2.** Edited by G. P. ELLIS, Benger Laboratories Limited, Holmes Chapel, Cheshire, and G. B. WEST, School of Pharmacy, University of London. Butterworths, London. 1962. ix + 201 pp. 16 × 25.5 cm. Price, \$11.25.

This compact volume, a worthy companion to Volume 1 of the series, consists of five chapters: 1, The Patenting of Drugs by F. Murphy; 2, The Testing and Development of Analgesic Drugs by A. H. Beckett and A. F. Casy; 3, Mechanisms of Neuromuscular Blockade by W. C. Bowman; 4, 2-Halogenoalkylamines by J. D. P. Graham; and 5, Anaphylactic Reactions by G. E. Davies. These articles, written by experts in their respective fields, provide authoritative, thorough, yet concise, reviews of the five topics.

Chapter 1 gives a clear, detailed, and up-to-date account of the procedures and problems involved in the patenting of drugs. Although the discussion of the requirements for securing patents in various countries is limited to those of the United Kingdom, the United States, France, and Germany, two tables conveniently summarize the scope and other characteristics of patents in numerous other countries.

In Chapter 2 are described the various types of analgesics which are capable of relieving moderate to severe pain and the tests used to assess their analgesic activity and addictive liability in animals and in man. This article admirably summarizes the status of the long and arduous search, still in progress, for a potent analgesic which is free of addictive liability and other undesirable side-effects. Although a considerable amount of structure-activity data is presented in the course of discussion of the development of clinically useful analgesics, full treatment of structure-action relationships as well as consideration of mechanisms of action, metabolism, and analgesic antagonists have been reserved for treatment in a future volume of this series.

Chapter 3 is devoted mainly to the physiology of neuromuscular transmission and to consideration of the possible mechanisms by which neuromuscular block is produced. Differences in the modes of action of various types of blocking agents are clearly de-