
 BOOK REVIEWS

Quantum Chemistry. An Introduction. By WALTER KAUFMANN, Department of Chemistry, Princeton University. Academic Press Inc., 111 Fifth Avenue, New York 3, N.Y. 1957. xii + 744 pp. 16 × 23.5 cm. Price, \$12.00.

In the chemist's effort to "understand" the atom and the molecule he has grasped at certain features of the approximate treatments of quantum mechanics such as resonance, ionic character and hybridization, and with a non-scientific tender-mindedness (W. James) set them up as realities and absolutes. One of the many fine aspects of the new quantum chemistry text by Professor Kaufmann is his carefully spelled-out warning of the dangers of such attitudes.

His text is intermediate in its level of difficulty between the two other texts with the same title.^{1,2} It is divided into five parts: Mathematical Introduction (140 pages); General Principles of Quantum Mechanics (110 pages); Atomic Systems (100 pages); Molecular Systems (140 pages); Non-Stationary States (200 pages). The mathematical introduction, written at a level well within the grasp of most chemists, is outstanding. His discussion of vibrating strings vibrating drum heads and pressure oscillations in gas chambers will give the student a vivid description of the states of a single particle. Degeneracy and hybridization are skillfully described in these same terms. For those who wish a smaller dose of mathematics, the author has indicated which sections may be eliminated without serious loss. The remaining sections are of uniformly high standard.

There are a few oversights. While the helium atom is extensively discussed, the author does not mention the work of Chandrasekhar and Herzberg (1955) which considerably reduces the level of uncertainty in the helium calculation. His very short treatment of group theory, and his neglect of crystalline field theory are regrettable. It is recognized that some topics must be omitted, but these are of great importance in that they transcend approximation. His judgment of free-electron theory (p. 680) appears a little harsh in view of its success. The only misprint noted was in the ionization energy of water on page 516.

The reviewer ventures to predict that the text will be widely adopted.

(1) H. Eyring, J. Walter and G. E. Kimball, "Quantum Chemistry." John Wiley and Sons, Inc., New York, N. Y., 1944.

(2) K. S. Pitzer, "Quantum Chemistry," Prentice-Hall, New York, N. Y., 1953.

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Annual Review of Nuclear Science. Volume 6. By JAMES G. BECKERLEY, Editor, Schlumberger Well Surveying Corporation, MARTIN D. KAMEN, Associate Editor, Washington University Medical School, and LEONARD I. SCHIFF, Associate Editor, Stanford University. Annual Reviews, Inc., Grant Avenue, Palo Alto, California, 1956. v + 471 pp. 16 × 23 cm. Price, \$7.00.

The 1956 volume of the Annual Review of Nuclear Science is clearly up to the standards established by its predecessors. Considering the intensity of effort expended in the areas encompassed by "Nuclear Science," we are indeed fortunate that this series exists.

Of the thirteen articles in the present volume, two should be of direct interest to chemists.

Under the title of "Generalized Acidity in Radio-chemical Separations," Horne, Coryell and Goldring present an interesting and lucid discussion of the role of acidity as a rather generalized concept in inorganic equilibria. Their discussion includes not only the classic field of aqueous solutions, but also goes into solvent extraction, ion exchange, non-aqueous solvents and liquid salt systems.

Taube's contribution on "Applications of Oxygen Isotopes in Chemical Studies" pays primary attention to homogeneous solutions. This very logically constructed

article is concerned first with the exchange of oxygen between the solvent water, and oxygen containing anions and cations; it then goes on to a discussion of the point of cleavage in hydrolytic reactions of both organic and inorganic species; and then proceeds to a fascinating review of which oxygen goes where in oxidation-reduction reactions involving oxygens. The article is indeed an outstanding description of the insight that we have gained into chemical phenomena in aqueous solutions through the use of isotopes.

Four other articles are of less immediate interest, but concern areas of investigation whose importance for chemistry can only increase with time. Included among these are a discussion of the mass and nuclear size effects in the "Isotope Shift in Atomic Spectra" by Mack and Arroe; a review of "Recent Advances in Low Level Counting Techniques" by Anderson and Hayes; a very thorough survey of "Nuclear Radiation Effects in Solids" by Brooks; and a critical discussion by Davidson, Loeb and Young of "Nuclear Reactors for Electric Power Generators." The fields discussed in the latter two articles in particular contain many interesting and technologically important chemical problems.

Of the seven remaining articles, two are in the area of radiobiology: papers published during 1955 on "Cellular Radiobiology" are reviewed by Gray; and O'Brien covers the field of "Vertebrate Radiobiology: Embryology." The latter article is somewhat the more informative to the uninitiated.

Three of the remaining five articles, "The Masses of Light Nuclides" by Mattauch, Waldmann, Bieri and Everling; "Properties of Medium-Weight Nuclei" by Way, Kundu, McGinnis and van Lieshout; and "The Excitation of Nuclei by Charged Particles" by Heydenburg and Temmer; are important contributions to our knowledge of the stationary states of nuclei.

The final two articles by Sarabhai and Nerurkar, and Wolfenstein, are concerned with "Time Variations of Primary Cosmic Rays" and the theoretical formalism employed in discussion of "Polarization of Fast Nucleons," respectively.

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Medizin und Chemie. Abhandlungen aus den Medizinisch-Chemischen Forschungsstätten der Farbenfabriken Bayer Aktiengesellschaft. Band V. FRITZ MIETZSCH, Editor and Director, Farbenfabriken Bayer Aktiengesellschaft, Werk Wuppertal-Elberfeld. Verlag Chemie, G.m.b.H., Pappelallee 3, Weinheim/Bergstr., Germany. 1956. 535 pp. 16 × 24 cm. Price, DM 30.-.

This book is a continuation of four volumes of "Medizin und Chemie" published by I. G. Farben before World War II. Its aim is to acquaint its readers with scientific problems presently under investigation at the Bayer Works and it is planned to publish one such volume every one to two years, alternating with the Pharmaceutical Department of Farbwerke Hoechst. This present volume contains about 40 contributions of which a large number emphasize chemotherapy. Some papers are of interest to the chemists, like Klarer's work on Sulfonamides, Chemistry and Pharmacology of Homologous Morphinanes, the development of "Resochin" and the Chemotherapy of Schistosomiasis. Many other contributions have apparently been written for the special purpose of being included in this volume and, therefore, lack the refreshing originality of publications for a scientific journal. "Medizin und Chemie" might appeal more to doctors than to chemists, who would probably prefer broad reviews written by specialists or a collection of Bayer's original publications. The reviewer cannot agree with some of the opinions expressed in the book. For example the statement that PAS and Isoniazide were not biologically screened before 1946 and 1950, respectively, because they

could not be patent protected, does not seem warranted. Also the expression that C-dihydrotoxiferine probably contains the yohimbine skeleton is not justified. The present volume gives a good survey of Bayer's interests and for this reason is worth studying. Its physical appearance is very good and the printing is excellent.

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Advances in Cancer Research. Volume IV. Edited By JESSE P. GREENSTEIN, National Cancer Institute, National Institutes of Health, U. S. Public Health Service, Bethesda, Maryland, and ALEXANDER HADDOW, Chester Beatty Research Institute, Royal Cancer Hospital, London, England. Academic Press, Inc., Publishers, 111 Fifth Avenue, New York 3, N. Y. 1956. ix + 416 pp. 16 × 23.5 cm. Price, \$10.00.

Volume IV of the series *Advances in Cancer Research* reflects quite well the editors' awareness of timely topics and of appropriate authors for their review. This volume successfully continues the pattern, established in earlier volumes, of achievement of the objectives of the editors as stated in introductions to the first two volumes. This is the reflection of the "steady and inevitable march of the tides of our knowledge and increasing understanding" in cancer research and provision of a "recurring stimulus to the work ahead" in addition to providing an annual chronicle of progress.

Though the selections in the present volume are timely, informative, and useful from the viewpoint of the cancer research investigator, they may as a whole be of less interest to chemists than preceding volumes; however, there are a number of chapters in Volume IV that will make its reading well worth while for chemists whether actively participating or merely interested in cancer research. The chapter, *Advances in Chemotherapy of Cancer in Man*, by Sidney Farber and associates, presents problems in clinical studies, surveys the chemotherapy of acute leukemia, and reviews selected chemotherapeutic agents. It is so written that it can serve as an introduction to clinical cancer chemotherapy as well as being useful for experienced investigators. The chapter furnishes a convenient bibliography of general references in addition to those specifically used in the text. This reviewer with his prejudices differs on the historical aspects of a few of the text references. The second chapter of the book, *The Use of Myleran and Similar Agents in Chronic Leukemias*, by D. A. G. Galton, also is concerned with clinical studies with particular emphasis on a limited group of chemotherapeutic agents. Like the first chapter this one provides valuable information for the clinical investigator and for others some insight on problems in clinical chemotherapy investigations.

The chapter, *The Employment of Methods of Inhibition Analysis in the Normal and Tumor-Bearing Mammalian Organism* by Abraham Goldin, presents much of this investigator's studies and ideas on the application to experimental cancer chemotherapy of the principle of inhibition analysis previously developed in microbiological studies. The author suggests that a more detailed study of the tumor-host relationships in the responses to various toxic drugs may indicate ways in which the chemotherapy of cancer can be improved. The two chapters, *Some Recent Work on Tumor Immunity* by P. A. Gorer and *Inductive Tissue Interaction in Development* by Clifford Grobstein are important contributions to this volume. A discussion of aspects of tumor immunity is most timely in view of the upsurge in interest in this subject. The mutual relevance of studies of inductive tissue interaction and of carcinogenesis is apparent if one assumes "that involved in embryonic induction are the origins of reactions and materials which form the basis of stability of structure and function of the adult and also that similar processes may be operating in newly developed subsystems of the adult and that they may be involved in reverse in the adult when adult stability of structure breaks down or is disrupted." These two chapters will pose a problem for most chemists because of their lack of familiarity with the language used. The more venturesome chemists reading these chapters will at least be rewarded with a better idea of the complexities of biological phenomena.

Lipids in Cancer is a chapter presenting a review of lipids

in induced carcinogenesis and spontaneous tumorigenesis, of the lipids of tumors, and lipids in the tumor-host relationship by Frances L. Haven and W. R. Bloor, who have contributed so much to this field. The material reviewed should stimulate greater efforts in this area and is likely to have an increased audience because of interest in the cardiovascular diseases. The remaining two chapters represent specialized aspects of carcinogenesis. A. Lacassagne and associates summarize the results of studies, largely from their laboratories, on *The Relation between Carcinogenic Activity and the Physical and Chemical Properties of Angular Benzacridines*. The carcinogenic activities of a considerable number of benzacridines are conveniently summarized in a lengthy table. Other tables present relationships of carcinogenicity with physical properties and are discussed in the text. *The Hormonal Genesis of Mammary Cancer* by O. Mühlbock is a good survey in this complex area. Studies in rats and mice are discussed with emphasis on the hormonal influence as one of a number of factors involved in mammary cancer.

Volume IV of *Advances in Cancer Research* has been built with the high quality of scientific and physical workmanship observed in earlier volumes. Very few typographical errors were noted. On page 42 the formula for thio-guanine is mislabeled as a pyrimidine. On page 105 in Case 21 it would seem that the dose for urethan is misstated or possibly urethan was inadvertently written in place of myleran. The essential author and subject indexes are provided. A brief check of the latter indicated that an increase in its usefulness, through added cross indexing, might reasonably be requested.

This volume merits a place in the library of the serious cancer investigator and will provide chemists and others a good introduction to a number of important areas of cancer research. This may also be anticipated from future volumes of the series *Advances in Cancer Research* if we are to judge from the first four volumes.

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Thermodynamics and Statistical Mechanics. By A. H. WILSON, F.R.S. Cambridge University Press, 32 East 57th Street, New York 22, N. Y. 1957. xv + 495 pp. 18 × 26.5 cm. Price, \$9.50.

This beautifully presented and printed book by the distinguished author of "The Theory of Metals" is in many ways a rather peculiar hybrid of thermodynamics and statistical mechanics, intended, says the author in his Preface, mainly for theoretical physicists, while the notice on the jacket announces as additional possible audience "those experimental physicists and physical chemists who wish to enter more deeply than is customary into the fundamental principles of the subject." How well the author may have succeeded in his appeal to the theoretical physicist will probably be made clear in the reviews which will appear in physics journals. As far as the physical chemist is concerned, whether he considers himself as theoretical or experimental, the usefulness of this book is very debatable.

The book begins with a 3-page List of Important Symbols, Units and Physical Constants. Chapter 1 treats "The Classical Development of Thermodynamics and the First Law." The presentation is highly condensed and contains none of the applications of importance to the physical chemist. Guggenheim's "Zeroth Law" is ignored. Chapter 2 is devoted to "The Classical Development of Thermodynamics and The Second Law." What is presented as Carnot's theorem is the following statement: "There exist two functions of the state S and T , where T is a positive function of the empirical temperature θ only, such that, in any infinitesimal quasi-static change of a body or system of bodies, $dQ = T dS$." Even for theoretical physicists several better presentations of the second law immediately come in mind. The chapter finishes with four brief pages on the thermodynamics of a perfect gas. In Chapter 3 the thermodynamic functions are introduced, Helmholtz' free energy being called free energy at constant volume and Gibbs' free energy or free enthalpy being called free energy at constant pressure. This chapter includes a treatment of equilibrium and its stability in the case of homogeneous sys-