

date periodically through the technical papers presented at these symposia. In this sense the organizers of the symposia have a great responsibility for presenting a fair and complete coverage of the high grade research throughout the world. Unfortunately the reviewer was particularly distressed that the Fifth International Symposium on Combustion would not accept any papers on the subject of the theory of flame propagation. This seemed unfortunate since it is difficult to separate the experimental from the theoretical interpretations. The illustrious members of the various subcommittees are not given an opportunity to make policy decisions. The organization of the Round Tables and the types of research presented are determined largely by the whims and prejudices of Dr. Lewis.

The categories of papers included are: Combustion in Engines, Combustion of Fuel Droplets, Propellant Burning, Diffusion Flames and Carbon Formation, Special Techniques, Flame Spectra and Dissociation Energies and Kinetics of Combustion Reactions. Approximately half of the papers pertain to the kinetics of combustion reactions. The majority of the papers are quite excellent.

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Chemistry of the Solid State. Edited by W. E. GARNER, D.Sc., F.R.S., C.B.E., Emeritus Professor, University of Bristol. Academic Press, Inc., Publishers, 125 East 23rd Street, New York 10, N. Y. 1955. viii + 417 pp. 16.5 X 25.5 cm. Price, \$8.80.

This book deals with the theory of the solid state and its relationship to various physical and chemical problems. The first seven chapters present fundamental methods and theory while the next eight chapters describe applications. The fifteen chapters are as follows:

1. "Chemistry of Crystal Dislocations" by F. C. Frank introduces those aspects of dislocation theory which have importance in such chemical topics as crystal growth, crystal solution and heterogeneous catalysis.

2. "Lattice Defects in Ionic Crystals" by F. S. Stone describes in greater detail defect theory as it applies to the theory of electrical conductivity and diffusion in the ionic lattice.

3. "The Action of Light on Solids" by P. W. M. Jacobs and F. C. Tompkins is concerned with the action of light, X-ray and electron beams in introducing extra electrons, excitons, f-centers, etc., and the consequent thermal deactivation, phosphorescence or photolysis of solids.

4. "The Surfaces of Solids" by P. W. M. Jacobs and F. C. Tompkins surveys the methods of surface area measurements, pore size distributions, particle size and shape determinations, and surface tension studies as applied to finely divided materials.

5. "Semi-Conductivity and Magneto-Chemistry of the Solid State" by T. J. Gray is a review of the methods and phenomena of intrinsic and impurity semi-conductivity and di-, para- and ferromagnetism as related to solid state reactions, absorption catalysis, imperfections, etc.

6 and 7. "Theory of Crystal Nucleation from Vapor, Liquid, and Solid Systems" by W. J. Dunning and "Classification and Theory of Solid Reactions" by P. W. M. Jacobs and F. C. Tompkins together represent a good summary of the theories of nucleation and growth as presently conceived. These chapters should prove particularly useful to the investigator who desires to classify kinetic data of the nucleation and growth type.

8. "The Kinetics of Endothermic Solid Reactions" by W. E. Garner deals mainly with the kinetics of dehydration of hydrates and the decomposition of carbonates.

9. "The Kinetics of Exothermic Solid Reactions" by W. E. Garner analyzes the kinetics of the decomposition of metal azides, oxalates, permanganates, chlorates and perchlorates, nitrogen iodide, nickel formide and lead styphnate. A separate section by L. L. Bircumshaw analyzes the kinetics of decomposition of ammonium salts, mainly the nitrate, permanganate and perchlorate.

10. "The Decomposition of Organic Solids" by C. E. H. Bawn introduces the reader to some basic fundamentals in the pyrolysis of organic compounds including the theory of thermal explosion.

11. "Explosion and Detonation in Solids" by A. R. Ubbelohde describes the principal characteristics of explosion and detonation, and their initiation together with experimental methods for studying detonation velocity.

12. "Solid-Solid Reaction" by A. J. E. Welch reviews the principal phenomena and possible mechanisms involved in the reaction between two or more solids from the point of view of structural inorganic chemistry and crystallography.

13. "The Photographic Process" by J. W. Mitchell deals mainly with the changes occurring in crystals of silver halides during chemical sensitization and the formation of the latent image.

14. "Oxidation of Metals" by T. B. Grimley is concerned mainly with the kinetics and reaction mechanisms of the oxidation of those metals which form protective oxide layers, *i.e.*, those metals for which the volume of oxide formed is equal to or greater than the volume of the metal oxidized.

15. "The Electronic Factor in Chemisorption in Catalysis" by F. S. Stone summarizes the available information on the nature of the adsorbate-adsorbent bond in chemisorption.

The subject of this book is so large that it would require many volumes to deal with it exhaustively. The authors of the various chapters have in general taken great pains to delineate the area of their treatment but the reader must realize that more is often left unsaid than said. Even in the delineated areas there are some surprising omissions; surely the respected methods of the ultracentrifuge deserve a place in any review of the procedures of determining particle size and shape! The book is well written by recognized authorities; it represents in easily accessible form, critically evaluated information obtainable otherwise only in the original literature. The ample bibliographies represent a good introduction to that literature. Twelve pages of author and subject index are helpful. This book which is of graduate student level should be available to all workers in the fields of catalysis, solid state physics, gas solid reactions, solid reactions, photography, corrosion and related topics.

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Beta- and Gamma-Ray Spectroscopy. Edited by KAR SIEGBAHN, Professor of Physics, University of Uppsala. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N.Y. 1955. xxiii + 959 pp. 18 X 25 cm. Price, \$20.00.

We have in this thick volume an ambitious attempt to cover in complete detail an important and well-defined branch of nuclear physics: the oldest, and once the most unintelligible branch, that of beta- and gamma-radioactivity, now generalized to beta- and gamma-spectroscopy. It is a pleasure to be able to report that the attempt is successful; a veritable handbook in the old German tradition has been produced, in which one can find almost everything of consequence on the subject.

The task of preparing such a handbook is so formidable as to daunt the bravest. We are indebted to Professor Siegbahn, as editor, and to the forty-two authors (who constitute a "Who's Who in Beta-Rays,") for tackling this task. No such complete treatment has been attempted since the appearance in 1930 of Rutherford, Chadwick and Ellis's classical treatise on "Radiations from Radioactive Substances." Even a superficial comparison will reveal the enormous magnitude of the advances of a quarter century. The earlier book appeared just two years before the discovery of the neutron, and thus essentially summarized the entire early history of nuclear physics, before anyone knew even what the nucleus was composed of. The apparent lack of conservation of energy in beta-decay had been discovered, but the neutrino had not, nor had transmutation with artificially accelerated particles, nor artificial radioactivity. At present, on the other hand, we have just reached a new milestone in the development of the theory of beta-ray decay; the choice among possible interactions responsible for the process appears to have been finally resolved to a combination of scalar and tensor forms.

Thus the time is propitious for an authoritative and complete review of the subject.

The present compendium presents us with a review of the advances of the last twenty-five years, including not only the phenomenal development of experimental discoveries and techniques, but also an excellent set of articles on the theories relevant to the phenomena of beta- and gamma-ray emission. A complete account of the present status of all the techniques of detecting and measuring the beta- and gamma-rays, and of studying beta-active substances, is given. It is interesting to note that the precision of energy measurements is now determined in some cases by the inherent line-width, so that an ultimate limit has been reached. The theories of beta-decay, multipole radiation, internal conversion, the nuclear shell model, the collective model, and angular correlations are given in considerable detail; they constitute the most difficult chapters of the book for non-specialists.

The final result is a comprehensive picture of what is now probably the best-understood branch of nuclear physics, and the one with the widest applications in other sciences, in technology, and, alas, in politics.

There is no doubt that this book is indispensable to anyone who wishes to work with radioactive substances. It can be recommended to the advanced research worker and to the novice alike; its range is complete and the treatments given almost uniformly good. Irreverent students will soon be referring to it as the "Bible." It is, in fact, difficult to single out any of the forty-two contributors for particular notice. In addition, the appendices contain tables of X-ray and gamma-ray absorption coefficients, the special functions occurring in the theory of beta-decay, internal conversion coefficients (only in the K-shell; the recent L-shell values were too late to include), angular correlations and electron $B\rho$ vs. energy values.

Professor Siegbahn and the forty-two authors are to be congratulated on a monumental job excellently done. The only cavil one can think of is that there might have been one more chapter giving a historical survey of the development of all the knowledge set forth here. Perhaps the editor was too modest to recognize the completely definitive nature of this book; or perhaps his mind was still on the unsolved problems remaining rather than on the problem of obtaining historical perspective on the immediate past. The field of beta- and gamma-radioactivity here defined offers an almost classically perfect example of how phenomena, once completely mysterious, come finally to be understood; and an intimation at least of the blood, sweat and tears that were required to achieve this understanding would have been well worth the trouble.

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Silicon, Sulphur, Phosphates. IUPAC Colloquium, Münster (Westf.), Ger., 2-6 September, 1954. Verlag Chemie, G.m.b.H., 17a Weinheim/Bergstr., Pappelallee 3, Germany. 1955. xi + 292 pp. 17 x 24 cm. Price, Kart. DM 24.

The text of the lectures and discussions presented at the Colloquium of the Section for Inorganic Chemistry of the International Union of Pure and Applied Chemistry, held on September 2-6, 1954, at Münster (Westfalen), Germany, is presented in the form of a book of nearly 300 pages, well arranged and attractively printed on paper of good quality, but with paper binding.

In an introduction, in German and French, the events which took place at the colloquium are recorded, such as the presentation of the Alfred Stock prize to Dr. Emeléus of Cambridge University. The international character of the conference is emphasized by the fact that the different papers are presented in German, French or English, and that the authors of the comprehensive lectures and communications included in the text represented eight nations—France, Holland, England, Belgium, Austria, Switzerland and Germany, as well as the United States. Fourteen of the papers were concerned with silicon and its compounds; and 21 with phosphates and condensed (meta-) phosphates.

The papers presented represent recent research in the three fields selected for the colloquium, and they include a number

of significant contributions. The impression is gained that Dr. Klemm in his introduction correctly concludes that the Münster colloquium proved that such a conference, in the course of which a well-defined theme is discussed on an international basis by specialists, is very fruitful, and that a repetition of such a meeting in the near future is very desirable.

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Progress in the Chemistry of Organic Natural Products. (Fortschritte der Chemie Organischer Naturstoffe). Vol. XII. Edited by L. ZECHMEISTER, California Institute of Technology, Pasadena. Springer-Verlag, Mölkerbastei 5, Wien 1, Austria. 1955. x + 550 pp. 17 X 23.5 cm. Price, \$19.00; Ganzleinen, \$19.80.

In the latest addition to the series, Prof. Zechmeister has again assembled an attractive group of specimen chapters drawn from many corners—well-mapped as well as relatively unexplored—of the extensive and variegated forest of natural product chemistry. Emphasizing biosynthesis and the role of organic chemistry in living systems, the volume features a wide range of subjects described by frontiersmen active in the particular fields under consideration: (1) Sesquiterpenes and Diterpenes, by A. J. Haagen-Smit; (2) Tetracyclic Triterpenes, by E. R. H. Jones and T. G. Halsall; (3) Neure Vorstellungen auf dem Gebiete der Biosynthese der Steroide und verwandter Naturstoffe, by R. Teschesche; (4) Some Biochemical Aspects of Fungal Carotenoids, by F. T. Haxo; (5) The Pyrrolizidine Alkaloids, by F. L. Warren; (6) Paper Chromatography in the Study of the Structure of Peptides and Proteins, by E. O. P. Thompson and A. R. Thompson; (7) Acides aminés iodés et iodoprotéines, by Jean Roche and Raymond Michel; (8) Chemistry and Biochemistry of Snake Venoms, by Karl Slotka; and (9) Gene Structure and Gene Action, by G. W. Beadle.

The more classical organic chemist should be attracted to the timely and up-to-date reviews in the two chapters dealing with terpenes and the one concerned with pyrrolizidine alkaloids. Sesquiterpenes, diterpenes, abounding in natural product research, are of necessity treated cursorily as individuals, although the coverage is broad. Profs. Jones, Halsall and Warren are able, on the other hand, to include all the triterpenes or alkaloids appropriate for their chapters as well as to summarize the complete structural development for each natural product. Of value to researchers interested in techniques, the chapter contributed by the Thompsons boasts inclusion of all the phases implied by the title: principles, utility, and working details. The biosynthesis of steroids is treated competently by Teschesche, who not only surveys the recent findings and current hypotheses but also helps shape the contribution by supplying his own approach and philosophy in this important field. Bordering on the chemistry of life processes are investigations of iodoaminoacids and iodoproteins; structure and occurrence of fungal carotenoids; and, especially, the structure of genes. The presence of these chapters as well as the one dealing with the somewhat bizarre topic of snake venoms came as a pleasant surprise to the reviewer, since summaries of recent activities in these areas are not common. Generally speaking, then, Volume XII features a cross-section of subjects, one or another of which should appeal to the organic chemist, biochemist, pharmaceutical chemist, geneticist. This diversity may double as a drawback, since it is unlikely that all the topics treated would appeal strongly to any one of the specialists mentioned above.

Except for those numbered (3) and (7) above, all chapters are written in English.

While perusing some sections and skimming others, the reviewer uncovered only a few typographical or editorial errors. The book is well-bound and the paper is of a high quality. A goodly number of tables and diagrams are included; and there is a generous supply of organic structural formulas, which are reproduced attractively and accurately.

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