

lated information. My only complaint is minor: a compilation of commercially available items such as ion gages and bakeable valves, preferably with prices, would have been highly useful. (Such a compilation is to be found by G. Ehrlich, *Advan. Catalysis*, 14, 421 (1963).)

The book also contains chapters on the generation of clean surfaces and their properties and a chapter on miscellaneous applications. I found these chapters somewhat less useful; they do little more than to provide the nonexpert with the briefest of introductions to various topics, like field and ion emission microscopy, low energy electron diffraction, and so on. However, they do round out and give some perspective to the book, and I suppose I should not grumble. The general and chapter references are very good, and all in all this should be of great help to the large variety of scientists and engineers concerned in one way or another with ultrahigh vacuum.

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ROBERT GOMER

Invitation to Chemical Research. By E. EMMET REID, Ph.D., LL.D., Professor of Chemistry, Emeritus, Johns Hopkins University. Franklin Publishing Co., Inc., Palisade, N. J. 1961. xviii + 366 pp. 15 × 22 cm. Price, \$10.60.

In this book Dr. Reid has distilled from the experience of his seven decades of chemical research and teaching the personal essence of the motivations, demands, and rewards of chemical research. The first six of his twenty-two chapters are general in nature, "Research the Basis of Progress," "The Development of Research," "Incentives," "Finding Problems," "Attacking a Problem," and "Research by Undergraduates." Chapters 7 through 13 deal with specific topics in organic chemistry that make one wonder if the book might have been more definitively titled, "Invitation to *Organic* Chemical Research." Chapters 15 through 21 deal with various aspects of the chemical literature, its use, its organization, its resources, placing emphasis on the inspirational and time-saving features of this essential of scientific investigation. The twenty-second, and last, chapter is entitled "Reporting Results" and is concerned with both the obligation to publish and the form of its presentation.

The style of the book is sprightly and is epitomized by its opening clause, "It has been great to have been living in this amazing half century. . . ." Throughout the writing is simple, straightforward, and unaffected.

There is difficulty in determining the exact audience for whom the book was specifically written. Dr. Reid makes it "a personal invitation to you and you and you. . .," but is the "you" the undergraduate of Chapter 6 or the teachers of p. 91? It is my own opinion that the book can be relished by, and a stimulation to, those of experience in the field. It is difficult to take broad cuts from so much experience and still have a volume that can be held in one hand!

In wondering whether Dr. Reid has taken perhaps too materialistic a point of view in much that he says about the returns from research, one must remember that chemistry is, after all, dealing with things about which there are ideas rather than with pure ideas. The references cited are from a broad selection, and there are contributed essays by many authors in their fields of specialization. It is rare today to find special contributions from the late Ira Remsen (pp. 2 and 37).

Dr. Reid's book is a unique record of the sources of stimulation of a spirit that has sought to answer questions for itself for many years and to give to others, his students, the students of his students, chemists in training and in industry, a feeling of the joy that he has had in his chosen profession and the promise that they might have it as well.

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JACKSON P. ENGLISH

Intermediary Metabolism in Plants. By DAVID D. DAVIES, Division of Food Preservation, C.S.I.R.O., Sydney, Australia. Cambridge University Press, 32 East 47th St., New York 22, N. Y. 1961. xii + 108 pp. 14.5 × 22 cm. Price, \$4.00.

This little book was apparently written to introduce students in an honors botany course at the University of London to the

knowledge and problems of metabolic pathways, their nature, basis, and interaction. Evidently not a substitute for a good thorough biochemistry introductory text, it is questionable whether the book will serve well as a provocative introduction and commentary to the unsolved questions regarding control, direction, regulation, and interaction of metabolic paths.

One shortcoming of the book is discursiveness; another is poor organization of which the lack of chapter subheadings and prefatory and summary statements seem to be a symptom. The first chapter "Metabolic Patterns and Cellular Organization" is an example. The first paragraph presents the view that the organization of a multi-enzyme system depends on the substrate specificity of the enzymes. Without further explanation, there follow six pages of a poorly documented exposition of enzyme kinetics, the apparent purpose of which is to show that one step in a sequence of reactions may be rate-limiting. Next, there are two pages on product inhibition and feed-back effects on rate of reaction, and, then, three pages giving a detailed summary of Vennesland's work on the stereospecific hydrogen transfer of NAD. Next, several pages briefly summarize the Krebs' cycle, the photosynthetic carbon cycle, and the pentose phosphate pathway. Finally, there are some remarks on "branching points" in metabolism and the rates of competing reactions. Although these various topics can be pertinent to the determination of "metabolic patterns" (the bearing on "cellular organization" is less easy to comprehend), the order of presentation, and the lack of guidance in the transition from one topic to the next, make it difficult for the reader to follow the author's logic. The remaining chapters—"Organization and Structure," "Bioenergetics," "Catabolism," "Anabolism," "Links between Metabolic Pathways," "Conclusion"—provide similar difficulties, due to the unemphasized and unanticipated shifts of topic.

Books dealing with the problems of metabolic control and the interaction of pathways are needed, especially for biochemistry and biology students who have mastered a general biochemistry course. One wishes for a better organized, more deliberate text than the one reviewed here.

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High Pressure Physics and Chemistry. Volumes 1 and 2. Edited by R. A. BRADLEY, Department of Inorganic and Structural Chemistry, The University, Leeds, England. Academic Press, Inc., Ltd., Berkeley Square House, Berkeley Square, London, W1, England. 1963. (1) xi + 444 pp.; (2) 361 pp. 16.5 × 23.5 cm. Price, (1) \$15.50; (2) \$12.50.

These two volumes contain perhaps the most comprehensive review attempted for the field of high pressure since Bridgman's classic monograph some thirty years ago.

In Volume 1 the topics treated most completely are: properties of compressed gases, spectroscopy of liquids and solids, equations of state at relatively high pressures, and electrical properties of metals and semiconductors. In each of these sections a reasonable review of theory is given, and all but the equations of state chapters give a good comparison with experiment. Any one of these sections would form an excellent starting place for an experimentalist entering the field or changing the direction of his high pressure research.

There are briefer or less complete discussions of techniques in general, of compressibility and transport in liquids, of phase changes, of superconductivity, of the properties of water, and of diffusion in solids. The last two sections in particular, although brief, are very elegantly done.

Volume 2 contains, first, a long discussion of the applications of high pressure in the earth sciences, especially of the chemistry of the crust and upper mantle. The emphasis is on geochemical rather than geophysical phenomena.

The following three chapters contain a thorough and well written discussion of chemical equilibria and chemical kinetics at high pressure. These will be of considerable interest and value to the experimental chemist or engineer.

The final major section of the volume contains a very clear and extensive coverage of shock wave phenomena. This chapter is particularly well illustrated. The authors have brought this rather esoteric technique within the understanding of any interested scientist. Finally, there are brief sections on radio spectroscopy, on X-ray techniques, and on miscellaneous topics.

The field of high pressure X-rays, in particular, is developing so rapidly that this section is necessarily quite out of date by now.

In a very rough way, one could say that Volume 1 covers "physical" phenomena and Volume 2, "chemical" material. There is, however, much of interest to the physical chemist or chemical physicist in Volume 1, and the shock wave chapter in Volume 2 is of definite value to the physicist. The articles are largely self-contained, and a person interested in a particular area could readily buy and use one volume only.

The quality of figures and of printing is generally good. The one complaint the writer would make is concerning the variety of pressure units used. These include bars and kilobars atmospheres, dynes per sq. cm., and kilograms per sq. cm. This adds an entirely unnecessary confusion to the study of different chapters.

It is probably of interest to compare these volumes with the recent book, "Solids Under Pressure" (Paul and Warschauer, Editors). The treatment of solids and, in particular, physical phenomena in solids is much more thorough in the latter book, but, of course, the subject matter of the present volumes is considerably more comprehensive. The quality of the individual chapters is comparable.

There has been a considerable increase in interest in high pressure phenomena in the past fifteen years, stimulated in part by the synthesis of diamond, but in large part also by an increased understanding of the importance of interatomic distance as a parameter for understanding the physics and chemistry of matter. With the development of more and more very different techniques for studies to be made with vastly different purposes in mind, and to test theories with little or no overlap, it is becoming less and less feasible to consider "high pressure" *per se* as an intelligible area for a conference or a book. In the future, high pressure results should and will be included in conferences and books on cohesive energies, chemical kinetics, molecular spectroscopy, chemical synthesis, electronic structure, etc.

If, indeed, this is the swan song of the general and comprehensive book on high pressure, then it is ending on a very fine note.

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The Chemistry of Beryllium. Topics in Inorganic and General Chemistry. By D. A. EVEREST, The National Chemical Laboratory, Teddington, Great Britain. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York 17, N. Y. 1964. 151 pp. 14 × 22 cm. Price, \$8.00.

This is the first of a projected series of monographs to appear under the collective title "Topics in Inorganic and General Chemistry." Dr. Everest has surveyed the chemistry of beryllium and presented it in a concise but readable book that is not too difficult for a junior or senior chemistry major. A teacher can find in it fresh and interesting examples to illustrate general chemical principles. The chemist who wishes to become acquainted with beryllium chemistry should start here although he will need to go to the original literature for more detail before beginning research in the field. The numerous references afford easy access to the literature, which appears to have been covered through early 1963.

After a brief historical introduction the behavior of the Be^{+2} ion in aqueous solution is discussed with the emphasis on its hydrolysis. The preparation and behavior of the salts of oxyacids, the halides, and complexes (including the oxide carboxylates) are treated in the next three chapters. Two chapters on simple binary compounds other than the halides and on organoberyllium compounds end the review of beryllium compounds. The last four chapters cover extractive metallurgy, analytical chemistry, health hazards, and nuclear properties. Applications of beryllium compounds are not discussed except as examples. By relating and comparing the behavior of one compound or class of compounds with the others as he goes along the author largely avoids the choppy, disconnected effect that is so common in a compound by compound enumeration.

In view of the general level of the presentation, I think more explanation and interpretation of Diebler and Eigen's work on BeSO_4 solutions is needed; the equation on p. 11 is certainly not

clear. The phase equilibrium diagram for BeF_2 on p. 41 should have been simplified or else all of the features it shows should have been discussed. There are, I feel, some occasional infelicities of style that indicate the publisher did not exercise proper editorial care. There are few misprints, and these minor.

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BOOKS RECEIVED

May, 1964

- JACQUES BÉNARD. "L'Oxydation des Métaux." Tome II. "Monographies." Gauthier-Villars, 55 quai des Grands-Augustins, Paris, France. 1964. 517 pp. \$13.00.
- E. EDWARD BITTAR. "Cell pH." Butterworth, Inc., 7235 Wisconsin Ave., Washington 14, D. C. 1964. 129 pp. \$5.75.
- GIUSEPPE BRUNI. "Chimica Generale E Inorganica." Tamburini Editore, Milano, Italy. 1964. 725 pp. L. 7,000.
- E. F. CALDIN. "Fast Reactions in Solution." John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1964. 306 pp. \$7.50.
- NICHOLAS D. CHERONIS and T. S. MA. "Organic Functional Group Analysis by Micro and Semimicro Methods." Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1964. 696 pp. \$25.00.
- A. D. CROSS. "An Introduction to Practical Infra-red Spectroscopy." Butterworth, Inc., 7235 Wisconsin Ave., Washington 14, D. C. 1964. 86 pp. \$3.50.
- AD. DAVY DE VIRVILLE and J. FELDMANN. "Proceedings of the Fourth International Seaweed Symposium. Biarritz-September 1961." The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. 467 pp. \$15.00.
- JOHN O. EDWARDS. "Inorganic Reaction Mechanisms." W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1964. 190 pp. \$7.00.
- A. A. ELDRIDGE, G. M. DYSON, A. J. E. WELCH, and D. A. PANTONY, Editors. "Supplement to Mellor's Comprehensive Treatise on Inorganic and Theoretical Chemistry." Volume VIII. Supplement I. "Nitrogen (Part I)." John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1964. 619 pp. \$50.00.
- LEROY EYRING, Editor. "Progress in the Science and Technology of the Rare Earths." Volume 1. The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. 532 pp. \$17.50.
- ROBERT F. GOULD, Editor. "Advances in Chemistry Series 44. Amino Acids and Serum Proteins." Special Issues Sales, American Chemical Society, 1155 Sixteenth St., N.W., Washington, D. C. 1964. 154 pp. \$5.50.
- JOEL H. HILDEBRAND and RICHARD E. POWELL. "Principles of Chemistry." 7th Ed. The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. 405 pp. \$7.50.
- International Union of Pure and Applied Chemistry. "The Chemistry and Biochemistry of Fungi and Yeasts. Proceedings of the Symposium on the Chemistry and Biochemistry of Fungi and Yeasts held in Dublin, Ireland, 18-20 July 1963." Butterworth, Inc., 7235 Wisconsin Ave., Washington 14, D. C. 1963. 181 pp. \$8.50.
- GERALD W. KING. "Spectroscopy and Molecular Structure." Holt, Rinehart, and Winston, Inc., 383 Madison Ave., New York, N. Y. 1964. 482 pp. \$10.75.