

solutions for the problems for typical instrumentation. A good applied radiochemist is a man who can achieve this same success with the particular nuclides and counting equipment required for his special problems. He would have to dig some, but the author has shown him the general problems and numerous examples of how they have been solved in typical cases.

The remaining quarter of the book deals with a wide-ranging selection of typical applications of radioactivity, going from chemistry to medicine and industry. Radioautography of thin slices is treated in some detail, but for biology alone; radiography, in similar detail for metallurgy. There is a small section on radiation protection problems and German legal requirements.

The book has 234 figures, a large fraction being plots with quantitative data for practical situations, although a few seem to be too highly specialized for the needs of the text. The literature references are fairly numerous and about one-half to the American literature, but they are not always to the most recent authoritative sources. On the whole, the book seems to be a good one for a general view of the very many ways radioactivity can be used as a tool in modern science and technology, and a useful one to encourage a new worker to broaden his techniques and to increase his abilities to use radioactivity effectively.

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Noble-Gas Compounds. Edited with Introduction by HERBERT H. HYMAN. The University of Chicago Press, 5750 Ellis Ave., Chicago, Ill. 1963. xiii + 404 pp. 16 × 24 cm. Price, \$12.50.

The book is, in the main, a collection of research papers by many authors on the novel and relatively new noble-gas compounds. The papers are an "up-to-the-minute" report on work done between the time of the publication of Bartlett's work on Xe + PtF₆, June, 1962, and April 22, 1963, the opening day of the conference on noble-gas compounds held at the Argonne National Laboratory. This book is an out-growth of that meeting. The amount of research described in the book is indeed impressive, since less than 1 year elapsed from the preparation of the first xenon tetrafluoride to the completion of the manuscripts for the book.

The first section contains a presentation of four papers which are concerned with a chronological account of some noble-gas chemistry up to and including the preparation of XeF₄. The first paper by E. N. Hiebert of the University of Wisconsin on the discovery of argon is very well done and is exceedingly appropriate for this book because his theme emphasizes the painstaking care that Ramsay and Rayleigh gave to their experiments and the reluctance of their contemporaries, particularly Dewar, to accept the fact that there could be an element or elements that did not exhibit chemical properties.

The second paper by D. M. Yost of the California Institute of Technology describes his experimentation on xenon with chlorine and fluorine in 1933 but without success. Yost's new generation experimenters were led by Bartlett and Jha at the University of British Columbia with their experiments on Xe and PtF₆. They were quickly followed by Claassen, Malm, and Selig at the Argonne National Laboratory with their preparation of XeF₄.

Editor Hyman has logically divided the book into sections devoted to the particular type of research. These sections after the Introduction are: "Preparation and Some Properties of Noble-Gas Fluorides"; "Some Practical Considerations"; "Thermochemistry"; "Aqueous Chemistry of Noble-Gas Compounds"; "Diffraction Studies and the Structure of Xenon Compounds"; "Studies of Electron Spin Resonance, Nuclear Magnetic Resonance, Mössbauer, Infrared, and Raman Spectra and Related Experiments"; "Physiological Properties of Noble-Gas Compounds"; and "Theoretical Studies of Noble-Gas Compounds."

An outstanding feature of the papers in the book, other than their fascinating subject, is the detail given regardless of whether a paper is describing a preparative procedure, a physical measurement, or a molecular orbital calculation.

Editor Hyman has aptly remarked that in this assemblage of papers one can find a presentation that concerns almost every technique that modern chemistry, physics, and technology has made available. The relatively simple structured xenon com-

pounds seem to be good illustrations for the demonstration of these techniques in this area of preparative, physical, and theoretical chemistry.

There are 58 papers and 105 contributing authors, and the quality of the research represented by these papers is probably higher than that on any other group of related compounds. In some few cases, further experiments since the publication of the book have modified the interpretation of data, but by and large, the book is as authoritative today as it was in April, 1963.

The book is remarkably free of typographical errors, and the quality of the printing and binding is excellent. The 14 unnumbered pages of glossy prints add a lot to the appearance of the book, but the regular page stock could have been used to perhaps reduce the price of the book.

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Theorie und Praxis der Gravimetrischen Analyse. Band I. Theoretischer Teil. By Dr. LÁSZLÓ ERDEY, Professor an der Technischen Universität Budapest, Mitglied der Ungarischen Akademie der Wissenschaften. Akadémiai Kiadó, Alkotmány U. 21, Budapest V, Hungary. 1964. 382 pp. 17.5 × 24.5 cm. Price, \$9.00.

This is the first of three volumes on gravimetric analysis, which has the somewhat mysterious title of "Theoretical Part." Actually, most of the theory is covered in some 60 pages dealing with solubility and formation of precipitates and coprecipitation. This part is classical in nature, although the treatment is more extensive than in most introductory textbooks on analytical chemistry. However, in some respects it is not up-to-date; e.g., no differentiation is made between homo- and heteronucleation, surface tension data originally given by Dundon have not been replaced with some more accurate values, and much space is devoted to the outdated von Weimarn theory. The scope of the book is wider than might be expected from the title. Thus, in the 100-page section on separations, some 50 pages are devoted to immiscible solvent extraction, chromatography (especially ion exchange), and volatilization separation.

The book is of much greater value to the practicing analyst than to the more academic analytical chemist. Operations for dissolving samples, destruction of organic substances, performance of precipitation, filtration, washing, drying, and ignition of precipitates are presented in great detail.

Volume II will deal with gravimetric determination of metals, and Volume III, of anions. These will be of special importance to the analyst, because the author and his associates have tested all the methods and have determined the thermal stability of the precipitates by derivative and straight thermogravimetric procedures.

Once upon a time, gravimetric analysis was the major method of analysis. It is still of fundamental importance for highly accurate analyses and for calibration of other techniques. However, its practice is now greatly reduced as a result of the development of a score of modern techniques. The present treatise may revive some interest in this classical method of analysis.

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Ultrahigh Vacuum and Its Applications. By RICHARD W. ROBERTS, General Electric Research Laboratory, and THOMAS A. VANDERSLICE, Vacuum Products, General Electric. Prentice-Hall, Inc., Englewood Cliffs, N. J. 1963. 199 pp. 16 × 23.5 cm. Price, \$9.00.

Although ultrahigh vacuums were first obtained some 40 years ago by Langmuir, it is perhaps fair to say that pressures below 10⁻¹⁰ mm. are still regarded with awe by all but a relative handful of initiates. However, the actual and potential applications of ultrahigh vacuum techniques are increasing rapidly, and this small but very useful book is therefore highly welcome.

It concerns itself principally with the creation and measurement of ultrahigh vacuum and the relevant chapters—"Components" (pumps, gages, valves), "Materials" (glasses, ceramics, metals), "Ultrahigh Vacuum Systems"—are excellent, up-to-date, easily intelligible to the nonexpert, and rich in useful tabu-

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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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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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.