ace, the increasing availability of commercial equipment to carry out measurements with positronium means that an expert knowledge of electronics is no longer a prerequisite for work in the field.)

The next two chapters of the monograph are devoted to a description of the behavior of positrons in gases and in solids and present the theoretical background for interpreting the "chemistry" of positronium in these media.

The last half of the book reviews the techniques and the often-conflicting observations of positronium chemistry in gases, organic liquids, and aqueous solutions. The many gaps in knowledge of the behavior of this species and suggestions for future work are clearly indicated.

It is refreshing to read a book so carefully edited and proofread in its printing. I am aware of only one typographical error.

This little monograph will probably be most interesting to radiation chemists, who will find many parallels to their own field in the chemistry of positronium, and to nuclear chemists. However, it should also be understandable and of interest to physicists, chemists, and biologists who want to keep abreast of challenging and potentially important new areas of research.

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**Chemistry and Technology of Explosives. Volume I.** By TADEUSZ URBANSKI, Department of Organic Technology, Politechnika, Warsaw. The Macmillan Co., 60 Fifth Ave., New York, N. Y. 1964. xv + 653 pp. 18 × 25 cm. $15.00.

This volume, presumably the first of three, is devoted almost exclusively to C-nitro aromatic compounds. Aliphatic and heterocyclic nitro compounds receive briefer treatment, reflecting their lesser interest in technology. Nitric acid esters and nitramines do not appear in this volume.

The book is a masterly treatise, reflecting the author's intimate knowledge of his subject. The manufacture and chemical, physical, and physiological properties of nitro compounds of interest in the technology of explosives are given detailed treatment. The first five chapters cover the art and knowledge of aliphatic and aromatic nitration and general information on the physical and chemical properties of the nitro group. A chapter on the general properties of aromatic compounds is followed by detailed exposition of essentially everything in the available literature on the mono- and polynitro derivatives of benzene, toluene, other aromatic hydrocarbons, naphthalene, halogen derivatives of benzene, phenols, aniline, and azo- and hydrazobenzene. Chapter XIX describes mono- and polynitro aliphatic compounds and the final one, dinitrodinitroso- and hexanitrosobenzene. Separate chapters are given to TNT and picric acid manufacture.

Although the author admits that these may not represent current practice, his diligence in searching out available information is illustrated by the inclusion of German and Japanese methods from BIOS, CIOS, FIAT, HEC, and PB sources.

Each chapter is followed by a bibliography covering the available literature through 1959, with a few references as late as 1962. Only a few patents are cited.

The book is surprisingly free of misprints, almost all of which are trivial. The only really deceiving one noted was the melting point of tetranitromethane: actually +14.1° but given as +3°C. The translation sets a high standard, with so few "Europeanisms" that it gives the impression of an English original. The printing, done in Poland, is excellent and the binding adequate. The book is well worth its relatively modest price and is recommended to all with interest in this interesting and actually little known area.

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**Ion Exchange Separations in Analytical Chemistry.** By OLOF SAMUELSON, Professor of Engineering Chemistry, Chalmers University of Technology, Goteborg, Sweden. John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 474 pp. 15.5 × 23.5 cm. $9.50.

In his "Ion Exchange Separations in Analytical Chemistry" Olof Samuelson has revised and expanded the content of his earlier book "Ion Exchangers in Analytical Chemistry." In the preface of the earlier edition he stated, "Only the principles of chromatographic separations by means of ion exchange resins and some applications will be briefly mentioned in this monograph. It is not intended to be a complete reference book in this field, but rather a sketch of the possibilities revealed." In contrast, the later edition appears to have considered all of the important publications in the field and is a good general reference book.

The over-all organization of the book was not changed in the new edition. As in the previous version the Introduction is followed by (1) a General Part, (2) a Practical Part, and (3) Applications. However, the organization of the parts have been changed considerably with the newer edition covering considerably more material and having some new sections not found in the earlier edition but omitting detailed descriptions of specific analyses included previously. The Introduction was changed only slightly; the section on ion-exchange chromatography was lengthened to reflect its increased importance in analytical procedures.

In the General Part two new chapters, "Applications of the Plate Theory" and "Non-aqueous Solutions," were added. The first three of the other four chapters (Chapters 2–4) were reorganized to give a more logical presentation than previously and expanded to cover publications in the past decade and others before 1952 not considered in the earlier edition. Chapter 5, "Column Operation," has been changed the least. This is understandable because it describes procedures which have not changed much in the past decade. Chapter 6 on the plate theory is an important addition to the text. It should be valuable to analytical chemists for calculating the separation to be expected in solutions of low ionic concentrations.

In the Practical Part of the book a chapter has been added on "Choice of Resin." This is an expansion of a section of another chapter in the previous edition and reflects the increase in the variety of resins available. A short description of the preparation and purification of resins for analytical use is also given in this chapter.

Of the other two chapters in the Practical Part, the first (Chapter 9 in the new edition) considers "Technique of Simple Ion Exchange Separations," and the second, "Technique of Ion Exchange Chromatography." The former has been reorganized in a more logical manner and partially rewritten but contains much of the same material used previously. The latter has been almost completely rewritten and greatly expanded. It considers the effects of the important variables on the separation of similar substances. It also describes fraction collectors and a number of methods for continuously assaying the eluate. It should prove very valuable as a guide to analytical chemists in the important technique of ion-exchange chromatography.

The Applications part is the largest section of the book. In the original edition it was more than half of the text. Because of the expansion of the first two parts in the new edition, it represents a somewhat smaller portion. The material in this section has been reorganized and applications restricted to separations of inorganic and simple organic ions. Whereas in the original edition the applications were largely those of concern to industrial chemists, the recent edition considers the separations in a more academic manner. The 1952 edition had 19 chapters in this section; in the new edition the number has been reduced to 7, although the length of the text has been increased slightly.

Chapter 11 in the new edition has the same title as before, "Determination of Total Salt Concentration." However, the text has been rewritten to describe several general methods, and applications and specific examples with references are tabulated.

In Chapter 12, "Removal of Interfering Ions of Opposite Charge," the content has also been reorganized with some revisions and rearrangements of the examples.

In Chapters 13 and 14, "Inorganic Colloids and High Polymer Electrolytes" and "Isolation of Trace Constituents," there have been fewer revisions. However, again the text in the new version is more general in its orientation and gives less attention to specific examples. In the latter chapter a description of methods for concentrating radioactive elements has been added.

Chapter 15 in the 1963 edition, "Metal Separations," is entirely new. It has been organized to follow the groups of elements in the periodic table in so far as possible and methods have been given for separating groups of elements and individual members of the groups. In the past decade a large number of investigations have been performed on such separations. All of the important group and elemental separations described in the literature are well summarized in this chapter.

The Introduction summarizes the separation methods and tabu-

lates the distribution coefficients of simple and complex ions of all of the elements. It also describes how these distribution coefficients can be applied to predict separations. An example of a qualitative separation scheme for a mixture of 10 elements from various groups is given. The Introduction is followed by more detailed descriptions of methods for separating the elements of each of the groups. One of these sections describes the separation of the actinides and compares their order of elution with that of corresponding members of the rare earths series.

Chapter 16, "Chromatographic Separation of Anions," is also new although part of its content was included in the first edition. It considers the more common anions; separation of the metal complex anions was covered in Chapter 15.

Chapter 17, "Inorganic Qualitative Analysis," appears in both editions but has been somewhat expanded in the latter. It is not apparent why the author retained this chapter in the new edition rather than presenting the material in earlier chapters where it would appear to fit. The description of the use of exchangers in "Spot Tests and Indicators" in this chapter is new and summarizes numerous publications describing these applications which have appeared since the first edition.

In conclusion, "Ion Exchange Separation in Analytical Chemistry" appears to be a well-organized presentation of the use of exchange resins for chemical separations. It should be of considerable value to analytical chemists and is a good general reference for all chemists.

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**Progress in Solid State Chemistry. Volume 1.** Edited by H. REISS, North American Aviation Science Centre, Canoga Park, Calif. The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. vii + 536 pp. 16.5 × 24 cm. $17.50.

It is not so long since the phrase "solid state" automatically implied a branch of physics; in retrospect this is a puzzling act of surrender on the part of chemists who have been concerned with the solid state since the inception of their subject. As pointed out by Professor Tompkins in the preface, the division of the subject between physicists and chemists—in so far as workers in either of these groups accept *any* division—is that physicists are interested mainly in the theory of the subject and an understanding of its implications; for the chemist, however, the subject is a much wider one, being concerned with the correlation of structure, energetics, reactivity, etc.—in short, almost the whole of physical chemistry.

This series sets out to provide at regular intervals a series of reviews on topics of current interest. In this first volume there are a large and varied number of articles. The Reviewer does not pretend to be knowledgeable on more than a few of these and, therefore, his remarks are restricted to a few articles in particular and to providing a summary in general of the book. In all there are eleven contributions. In a brief Chapter I, H. P. Kirchner discusses "The Thermal Expansion of Ceramic Crystals." Much original experimental data are provided and such theoretical understanding as is available is introduced. A good chapter is provided by M. F. C. Ladd and W. H. Lee dealing with "Lattice Energies." The latest experimental data are given and the variations between these values are discussed. A. Kjekshus and W. B. Pearson discuss phases with nickel arsenide structures in a long chapter in which structural data and magnetic and electrical properties are brought together. D. Grieg discusses "Lattice Imperfections and the Thermal Conductivity of Solids," while in the fourth chapter D. W. G. Ballentyne surveys briefly "Photoluminescence, Electroluminescence and Structure." "Ferroelectricity in Crystals" is surveyed by C. F. Pulvan in a long article in which a considerable amount of original work is presented. J. C. Woolley discusses alloy semiconductors; naturally most of the attention is devoted to the (post-) transition elements of interest in transistor work. Some aspects of organic semiconductors are examined by H. A. Pohl; there are no less than 176 references to this subject even though most of the work has been carried out in the past 10–15 years. L. V Azaroff discusses "X-Ray Diffraction Studies of Crystal Perfection," and the "Applications of Nuclear Quadrupole Resonance" are reviewed by G. A. Jeffrey and T. Sakurai. I found the latter chapter very stimulating; one hopes that perhaps this technique will help in the assignment of structure in the solid state in the future as n.m.r. has done for liquids and solutions. The final chapter by D. K. Huggins and H. D. Kaesz discusses the use of "Infra-red and Raman Spectroscopy in the Study of Organometallic Compounds." A wealth of original experimental data are presented and, although the limited space available prevents detailed discussion, the authors are able to show how widely applicable these techniques are for structural assignments.

This book is one which libraries will need to make available to chemists, but later volumes will prove more useful if fewer, but longer articles are provided. In articles such as these, it seems to the reviewer that the writers should be given scope to develop *ideas* as much as to present *facts*. One looks forward to Volume II wondering whether the Editor will be able to continue the superb impetus of Volume I.

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**Mammalian Protein Metabolism. Volumes I and II.** Edited by H. N. MUNRO, Department of Biochemistry, The University, Glasgow, Scotland, and J. B. ALLISON, Bureau of Biological Research, Rutgers, The State University, New Brunswick, N. J. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. 1964. 16 × 23.5 cm. Vol. I: xv + 566 pp. $18.50. Vol. II: xv + 642 pp. $21.00.

This two-volume treatise by a distinguished international group of authors will be of considerable value to the advanced student or investigator interested in mammalian protein metabolism. Volume I contains an excellent introductory historical chapter and Part I, "Biochemical Aspects of Protein Metabolism," comprising 10 chapters which cover all aspects of the field. These chapters include: digestion and absorption (two chapters), free amino acids and peptides in tissues, metabolic fate of amino acids, protein biosynthesis (two chapters), metabolism of plasma proteins, regulation of protein metabolism (two chapters), and elimination of nitrogen from the body. Volume II contains Part II, "Nutritional Aspects of Protein Metabolism," in six chapters and Part III, "Pathological Aspects of Protein Metabolism," in six chapters; this volume will be of particular interest to those concerned with problems in human metabolism and nutrition.

It would be unjust to single out for special mention specific chapters in a treatise by more than 30 authors. In general, the work is authoritative and clear in presentation. Some chapters are succinct in presentation summarizing major aspects of very large and general fields, but all chapters contain adequate references to other reviews as well as to specific papers. Other sections of the work, mainly in the more specialized areas of mammalian protein metabolism, are more complete in coverage. Fortunately for the progress of science and unhappily for authors, the interval between writing and publication of bound volumes inevitably leaves some gaps between the printed page and the actual state of knowledge in rapidly developing areas of investigation. The present work is no exception, but fortunately only a few chapters appear somewhat dated.

The volumes display careful editing and each contains complete author and subject indexes.

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**Molecular Complexes in Organic Chemistry.** By LAWRENCE J. ANDREWS and RAYMOND M. KEEFER, Department of Chemistry, University of California, Davis, Calif. Holden-Day, Inc., 728 Montgomery St., San Francisco, Calif. 1964. vii + 196 pp. 18 × 25.5 cm. $8.75.

This book was read with the bias of one who from 1953–1957 had occasion to determine many association constants by the spectrophotometric method using a modification of the Benesi–Hildebrand treatment proposed by the authors of the present text; who found that the constants obtained frequently varied with the wave length of measurement and the concentration ranges of the components; who observed cases where the spectrophotometric method gave values in disagreement with those obtained by other physical methods; who noted instances where the treatment appeared to indicate the presence of complexes where none in fact existed; and who was led, finally, to question the significance of many of these spectrophotometrically determined values. In all of these