Seventy-one pages are devoted to a summary of the properties of materials of construction commonly used in vacuum systems. Data are presented in tabular and graphical form on the outgassing properties, permeability, composition, electrical characteristics, and stability of metals, glasses, quartz, mica, ceramics, plastics, and rubbers. Vapor pressures, melting points, and boiling points are given for most of the elements, pump oils, greases, and high boiling organic liquids.

The properties and performance of metallic getters are covered in some detail.

The third section (92 pages) is extremely valuable. Most of the pertinent literature (books and journal articles) in vacuum technology and allied fields has been tabulated according to subject for the period 1948–1959. It is too bad that only a few references since 1959 appear.

The subject index is quite complete.

In conclusion, this book is heartily recommended to any chemist, physicist, or engineer who uses vacuum technology. It contains a great deal of material in an attractive, readily accessible, and concise form.

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Comprehensive Biochemistry. Volume 4. Separation Methods. Edited by MARCEL FLORKIN, Professor of Biochemistry, University of Liege (Belgium), and ELMER H. STOTZ, Professor of Biochemistry, University of Rochester, School of Medicine and Dentistry, Rochester, N. Y. American Elsevier Publishing Company, Inc., 52 Vanderbilt Avenue, New York 17, N. Y. 1962. xiii + 282 pp. 16 × 23 cm. Price, $13.00, single copy; $10.50, series price.

A volume on separation methods is clearly welcome in a series entitled "Comprehensive Biochemistry." Furthermore, the editors have chosen authors whose competence is unquestioned. What is disappointing in this volume is the selection of subjects to be considered as separation methods. The volume consists of chapters on countercurrent distribution (L. C. Craig); adsorption, ion exchange, and partition chromatography (E. Lederer and M. Lederer); and gas chromatography (P. Chovin). There are no sections on electrophoresis, gel filtration, membrane dialysis, sedimentation, or techniques for homogenization and extraction. While electrophoresis and sedimentation will be considered in the volume on proteins (Vol. 7), it seems unfortunate to this reviewer that so few topics have been included under the general title of separation methods.

The articles which have been included are excellently done. The treatments all emphasize principles rather than specific applications, but even so they are quite practical in orientation. Derivations are given for quantitative relationships, and good explanations are given for theoretical and empirical factors which are useful in choosing and controlling conditions and in designing experiments. The authors give just enough examples of application to be helpful without being distracting. This reviewer finds such a treatment of methods the most helpful for imparting to a nonexpert biochemist an understanding and sensitivity for advanced techniques. A further advantage to these treatments is their compactness: the same subjects have been treated by some of the same authors at greater length elsewhere.

There were places in which this reviewer felt there was inadequate emphasis (*e.g.*, cellulose resins were considered for only two pages), or omission (*e.g.*, the contributions of F. H. Carpenter to the theory of partition systems for chromatography), but these were few, and probably are matters of personal taste. The styles of writing were all clear and easy, even though a few spots of awkward translation were found in the last chapter.

This volume ought to be of great value to nonexpert biochemists who are interested in the particular subjects covered.

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Lectures in Materials Science. The Cornell Materials Science Center Lecture Series. Edited by PAUL LEURGANS, with P. J. W. DEBYE, P. J. FLORY, N. BLOEMBERGEN, and F. BITTER. W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1963. viii + 109 pp. 16 × 23.5 cm. Price, $7.00 clothbound and $3.95 paperbound.

Four lectures, given at the Cornell Materials Science Center in the spring of 1962, are recorded in this volume. The subjects vary widely. Each deals with a very limited aspect of "the science of materials," but does it very ably.

Professor Debye, as always, deals masterfully with the fundamental ideas underlying very complex phenomena, making a reader (or a listener) feel that he really understands the subject. In his lecture on "Macromolecules in Solution" Debye discusses the viscosity, osmotic pressure, and light scattering of solutions of linear macromolecules, showing how experimental measurements of these properties can lead to knowledge of molecular properties. His treatment of solution properties near the critical point—with which he has been most concerned in recent years—is especially fine.

Professor Flory, as everyone working in polymer science knows, has contributed a great deal to our knowledge of "Macromolecules in the Solid State," the subject of his lecture. He outlines an elegant statistical mechanical treatment of the configurations of macromolecules, both isolated and in highly concentrated systems, and then discusses phase transitions and the morphology of semicrystalline polymers.

Dr. Bloembergen discusses the basic ideas underlying "Magnetic Resonance and Its Applications," a field which has become of great importance in recent years. He deals with nuclear magnetic resonance and electron spin resonance and with solid state and hydrogen beam masers.

In a lecture on "Flows in a Steady Plasma," Professor Bitter describes and interprets his experiments, with John Waymouth, on discharge phenomena in mixtures of mercury and inert gases.

Each of these four lectures is a useful addition to the scientific literature. The reviewer hopes that those who would profit most from reading them will learn of their existence, in spite of their incorporation in a book with such a very general title.

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Quantum Theory of Molecules and Solids. Volume 1. Electronic Structure of Molecules. By JOHN C. SLATER, Institute Professor, Massachusetts Institute of Technology. McGraw-Hill Book Company, Inc., 330 West 42 Street, New York 36, N. Y. 1963. 16.5 × 23.5 cm. 485 pp. Price, $12.50.

This is the first of what is to be a series of three or more volumes, concerned with molecules and solids. They stand in their own right, but are clearly sequels to the two successful volumes on atomic structure by the same author, published three years ago. The complete set, which will almost form a library on the electronic structure of matter, represents a massive effort, which probably no one but Professor Slater would feel capable of attempting.

There are advantages and disadvantages in a series of this kind. One great advantage is continuity of argument and economy of space. The present volume can begin on the assumption that the reader already knows about atomic orbitals, angular momentum, electron spin, and much of the basis of wave mechanics. In this way an advanced level can be achieved. There are, in fact, only 250 pages of main text, with a further 150 pages of more specialized material in 15 appendices. Professor Slater writes with great confidence and with the clarity that we have come to expect of him.

This is a very workmanlike book, and one well designed to introduce the reader to techniques as well as general theory. Thus even complicated (but highly important) matters, such as the evaluation of two- and three-center integrals, are explained. In fact, the general argument proceeds largely from the full study of a series of special molecules, graded in ascending order of complexity—H_2, LiH, H_2O, CH_4, NH_3, with a final chapter of 20 pages on ethylene and benzene. Emphasis is laid on the molecular-orbital approach, and—for the first time—attention is directed to the significance of one-electron energies.

But, as mentioned earlier, there are certain disadvantages in Professor Slater's plan of a series of volumes. In the present case we could point to an almost complete absence of chemical concepts. There are only passing references to bonds, bond energies, bond moments, bond lengths; hybridization appears largely as an incidental factor in the combination of atomic orbitals and not as an almost regulative factor is determining valence angles and stereochemistry. There is nothing about the inorganic transition compounds, nor the properties of organic π-electron molecules larger than benzene. There is effectively no reference to the immense field of empirical, or semi-empirical, work that is sometimes called theoretical chemistry. The author says, with some justification, that these methods do not give accurate numerical values. What he does not say is that they may nevertheless give considerable chemical insight.

In short, this is a book for physicists. As a collection of the most important work on the nonempirical calculation of ground state (and a limited amount of excited state) energies, it is easily the most complete and readable account now available. The student who has read this volume and the recent *Handbuch der Physik* article on the same subject by Kotani, Ohno, and Kayama will be in a good way to understand any research work in this field and to start calculations of his own.

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