Section 4 deals with diffraction geometry. Relationships for fixed-crystal, moving single-crystal, Weissenberg, Buerger precession and random-orientation methods are summarized. No attempt is made to give a detailed account of the principles of these methods (references are provided to suitable textbooks); however, a sufficient description of the various methods is included to explain the application of given tables of functional relationships. A rather extensive review of the precision measurement of lattice parameters of polycrystalline specimens is also given in this section.

Section 5 deals with the Physics of diffraction methods, including a brief discussion, formulas and tables relating to polarization, temperature and structure factors and absorption corrections; this section concludes with a summary of the mosaic theory and formulas for integrated intensities. Section 6 is concerned with Fourier synthesis and structure factors. Formulas for various projections, transforms and structure parameter refinements are summarized and various aids for the practical evaluation of Fourier series and structure factors are described.

Section 7, entitled special topics, includes treatments of close packing, the use of statistical methods for the detection of symmetry elements, and inequality relations between structure factors. Useful exponential and trigonometric tables are provided in section 8. The volume concludes with a dictionary of crystallographic terms in English, French, German, Russian and Spanish.

The International Union of Crystallography and, in particular, the editors, editorial committee and contributing authors are to be commended for the preparation of this valuable reference work. Volume III is to be a compilation of physical and chemical data.

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Theory and Applications of Nuclear Induction. By AJIT KUMAR SAHA, Professor of Nuclear Physics, and TARA PRASAD DAS, Reader in Nuclear Physics. Saha Institute of Nuclear Physics, 92, Upper Circular Road, Calcutta 9, India. 1957. x + 516 pp. Price, $6.00.

This book, which bears the publication date 1957 and the manuscript for which was essentially completed in 1953, should perhaps be described as a textbook on the theory and application of nuclear induction. The things which it does are done in very great detail and the reader who is not well acquainted with the field and who wants not a general review of it but a really detailed account will find it a good book to start with. It contains too a bibliography, through 1956, which will be useful. But of course the fact that treatments will not be found for the newer topics in the present field, which is still a rapidly developing one, constitutes a major weakness of the book.

The first two of the seven chapters give the classical and quantum-mechanical theory of nuclear induction. Two more chapters give an account, which is extremely detailed and perhaps excessively so, of the experimental procedures for both the Bloch and Purcell type of experiment with many of their modifications and the results of measurements of relaxation times and other such parameters. The other three chapters give a good general discussion of nuclear relaxation times, electric quadrupole interaction effects, chemical shifts and so on. But in these chapters and elsewhere throughout the book the great mass of detail and the often pedantic treatment will disturb the reader whose interest in the subject is a more general one.

FYSISCH LABORATORIUM DER
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Theory of Unimolecular Reactions. By NOEL B. SLATER, University of Leeds, England. Cornell University Press, 124 Roberts Place, Ithaca, New York. 1959. xi + 230 pp. 16 × 24.5 cm. Price, $4.75.

Workers in the field of chemical kinetics will welcome this book in which the author presents his theory of the specific unimolecular reaction rate with exemplary clarity and thoroughness. The earlier investigations in the theory of unimolecular reactions are reviewed and serve to introduce the reader to the general problem. Following a chapter on normal mode analysis, the average behavior of a sum of normal vibrations is discussed. The first-order unimolecular rate is formulated first from the point of view of the frequency of peaks in the sum of normal vibrations, and then by using transition-state theory. The author's examination of the concepts involved in transition-state theory is of particular interest.

Another chapter is devoted to the problem of the general pressure rate constant, and here the contrasts between Slater's detailed theory of the dissociation probability and earlier theories are made quite clear. The numerical problems encountered in the application of the theory are fully discussed, and as an illustrative calculation the pressure dependence of the decomposition rate constant of nitryl chloride is worked out in detail. This calculation vividly exposes the fact that in the absence of a complete potential energy surface for the molecule, the selection of the critical coördinate is to a large extent arbitrary, even when the general mode of decomposition is known from chemical evidence. In particular, the author's section of the combination of the chlorine–nitrogen and chlorine–oxygen distance as the critical coördinate in nitryl chloride seems to have been dictated by an urge to obtain agreement between the theory and experiment, rather than by any logical molecular considerations.

After examining the assumption of the random incidence of dissociation configurations the author concludes by giving his approach to a quantum mechanical unimolecular rate theory.

A unified presentation of Slater's theory has been needed; in addition the entertaining style, mathematical rigor, and clear exposition of the transition-state theory will make this book appealing and useful even to those not directly concerned with gas phase unimolecular reactions.

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Solid State Physics. Advances in Research and Applications. Volume 9. Edited by FREDERICK SEITZ, Department of Physics, University of Illinois, Urbana, Illinois, and DAVID TURNBULL, General Electric Research Laboratory, Schenectady, New York. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1959. xv + 548 pp. 16 × 23.5 cm. Price, $14.50.

In keeping with the high standards set by the preceding eight volumes, volume 9 of the "Solid State Physics" series, edited by Seitz and Turnbull, again serves as an excellent guide to the recent advances in the ever expanding field of solid state research. The topics discussed in the present issue are: (1) The Electronic Spectra of Aromatic Molecular Crystals by H. C. Wolf; (2) Polar Semiconductors by W. W. Scanlon; (3) Static Electrification of Solids by D. J. Montgomery; (4) The Interdependence of Solid State Physics and Angular Distribution of Nuclear Radiations by E. Heer and T. B. Novey; (5) Oscillatory Behavior of Magnetic Susceptibility and Electronic Conductivity by A. H. Kahn and H. P. R. Frederikse; (6) Heterogeneities in Solid Solutions by A. Guinier; and (7) Electronic Spectra of Molecules and Ions in Crystals: Part II. Spectra of Ions in Crystals by D. S. McClure.

For the chemist this book contains two gems—the articles by Wolf and McClure. The organic and physical chemist will delight in the thorough review of the electronic spectra of crystalline aromatics. This article, when combined with McClure's very detailed survey of a similar nature in volume 8 of this series [D. S. McClure, *Solid State Physics*, **8**, 1 (1958)], serves as a comprehensive introduction to this fast growing field. The inorganic chemist need not despair, however (nor the physical chemist for whom this volume is a double boon), for the complete and knowledgible discussion of crystalline (or ligand) field theory given here by McClure will warm the cockles of his heart.

The remaining chapters of this book delve into domains which have become, for the most part, the private stamping grounds of the physicist. This circumstance is to be deplored as these realms of endeavor are as much a part and parcel of chemistry as they are of physics. For example, a glance at the articles on polar semiconductors and on the oscillatory behavior of magnetic susceptibility and elec-

tronic conductivity will show that these deal primarily with a description of the chemico-physical properties of simple compounds and the elements. Comments of a similar nature apply to the remainder of the papers contained in this volume. I am sure that this book will fill an embarrassing gap in the library of many a chemist.

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International Committee of Electrochemical Thermodynamics and Kinetics. (C.I.T.C.E.) Proceedings of the Ninth Meeting, Paris, 1957. Edited by T. P. HOAR. Butterworth and Co. (Canada) Ltd., 1367 Danforth Avenue, Toronto 5, Ontario, Canada. 1959. ix + 489 pp. 16.5 × 25 cm. Price, $24.00.

In accordance with the general program of C.I.T.C.E. the content of the volume is divided into the following main sections: (1) Potential–*p*H Diagrams; (2) Electrochemical Definitions; (3) Experimental Methods; (4) Batteries and Accumulators; (5) Corrosion; (6) Electrochemical Kinetics; (7) Semiconductor Electrochemistry.

Section (1) contains a thorough treatise by Pourbaix and co-workers of the *p*H–potential diagrams of each of the elements arsenic, antimony, bismuth, technetium, rhenium, niobium, tantalum, zirconium, boron, aluminum and chlorine in equilibrium with water, as well as a discussion by Valensi, *et al.*, of the thermodynamic standard functions of sulfide and polysulfide ions. These papers bring the survey of the equilibrium conditions in systems of single elements and water, to which C.I.T.C.E. has devoted a considerable attention, to a certain completion.

Section (2) consists of a report on the extensive work which the subcommittee on electrochemical nomenclature has performed under the chairmanship of Van Rysselberghe in coöperation with the International Union of Pure and Applied Chemistry. Definitions of basic electrochemical entities are presented and suggested for general use.

Section (3) contains a number of papers of great interest, among which should be particularly mentioned a description by Chauvin, Coriou, *et al.*, of a high vacuum cell for electrolytic preparation of pure metals up to 1000°, a brief survey by Gerischer of electronic potentiostats, a study by H. Fischer, *et al.*, of the mechanism of inhibitors by means of cathodic polarization curves, a paper by Lewartowicz on the standardization of overpotential measurements in oxidation-reduction systems, and a discussion by Ibl of the mechanism of electrolytic deposition of metal powders.

Section (4) is introduced by a survey of general scientific problems in primary and secondary cells, prepared by the subcommittee on cells and batteries. In the same section H. Winkler presents a contribution to the mechanism of the processes in sealed nickel–cadmium cells, and U. Tragardh a thorough study of the effect of hydroxide concentration on the capacity of the nickel oxide electrode.

Section (5) is limited to a paper by Schwabe on the passivity of nickel and cobalt, whereas Section (6) contains contributions from various countries among which are particularly to be mentioned those on the Ag/Ag^+ electrode (Gerischer), the electrolytic reduction of persulfates and the electrolytic oxidation and reduction of chlorites (Rius, *et al.*), the electrolytic separation of hafnium and zirconium in molten media (Chauvin, Coriou, *et al.*), the application of O^{18} for the study of anodic processes (Frumkin), and the effect of specific anion adsorption on hydrogen evolution kinetics (Kolotyrkin).

In Section (7) are found papers by Francois on electric conductivity of vacuum deposited germanium films, by Holmes on the correlation between orientation and etch patterns at germanium and silicon, and by Epelboin, *et al.*, on electrolytic polishing of germanium and silicon in non-aqueous media. Included in this section is also a paper by Llopis, *et al.*, on the sulfuration of metals by thiourea.

The volume also contains the addresses of T. P. Hoar and I. M. Kolthoff to the Colloquium on Modern Electrochemical Methods in Analytical Chemistry which was held in conjunction with the Meeting; and an abstract of the Symposium by Gauguin. The full texts of the papers at the Colloquium are published in *Anal. Chim. Acta*.

As can be seen from above, the Proceedings contain papers and surveys of interest to practically every electrochemist. In addition, there are a number of shorter communications and notes of specific interest to specialists in the various areas of Electrochemistry. Although some of the papers are of a controversial content and some papers—particularly by Russian contributors—are lacking in experimental detail, the majority of the contributions are of the very highest standard and form important additions to the electrochemical literature. The topics are further illuminated by discussions at the end of the papers.

The contributions are in English, French and German, with English dominating. The volume is well edited and well printed and illustrated. It is understood that the present volume is the last of the Proceedings published separately by C.I.T.C.E. and that the proceedings of the following Meetings are to appear in the new periodical *Electrochim. Acta*. It can, indeed, be said that the volume concludes in a most worthy way a series of publications which have both presented a wealth of new knowledge and served as a mirror of the present tendencies of development of Electrochemistry. Like the previous ones, the "Proceedings of the Ninth Meeting" deserve a place on the bookshelf of the electrochemist.

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Encyclopedia of Physics. Volume XII. **Thermodynamics of Gases.** Edited by S. FLÜGGE. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1958. vi + 686 pp. 17.5 × 25 cm. Ganzleinen, DM 154.—; Subskriptionpreis, DM 123.20.

The third edition of "Handbuch der Physik" also bears the title "Encyclopedia of Physics," reflecting the bilingual character of its articles. (The reviewer recalls at least three articles in other volumes in French.) There are Deutsch–Englisch and English–German subject indices. This new edition comes a quarter of a century after the one edited by Geiger and Scheel and promises to be a worthy successor.

This monumental encyclopedia of 48 volumes, like its predecessors, seeks to capture the current critical view of physics in the compass of several bookshelves in short monographs each written by a specialist. Editorial problems of overlapping and dove-tailing of subject matter, as well as of finding the right place for each aspect, must be exceedingly complex.

In the present volume the six articles deal with different aspects of the physics of gases with no unnecessary overlapping. They are indeed somewhat diverse. One may question the appropriateness of the title since the longest article deals with transport phenomena in gases of moderate pressure. Many aspects of kinetic theory and statistical mechanics have been assimilated into the fold of (equilibrium) thermodynamics under the heading of statistical thermodynamics, but in this instance thermodynamics seems to have had other eggs put into her nest.

The first article on the Properties of Real Gases (72 pages) is by J. S. Rowlinson of the University of Manchester. The chapters are entitled: perfect gases and real gases, the thermodynamic properties of real gases, experimental methods, the critical region, empirical equations of state, and gas mixtures. It is well written and is illustrated by 40 figures. Inclusion of plots of isotherms of f/p, C_p, and of $C_p - C_v$ *versus* p for typical gases, as well as Obert's generalized compressibility charts, would have been welcome. It is regretted that no notice was taken of two significant contributions of recent decades, namely, the Redlich–Kwong equation of state and Bartlett's modification of the law of partial pressures to mixtures of real gases.

In the Theory of Real Gases (132 pages), by J. E. Mayer of the University of Chicago, the chapters are entitled: general methods, the internal partition function, classical imperfect gases and quantum gases. One is struck by how much is new in the areas of the last two sections since the publication in 1940 of "Statistical Mechanics" by Mayer and Mayer. The author's summaries and transitions are well done and keep the perspective of the reader in focus.

Principles of the Kinetic Theory of Gases (90 pages), by Harold Grad of the Institute of Mathematical Sciences of New York University, is a survey of recent theoretical studies of the Boltzmann equation. Chapters I and II are entitled: the place of the Boltzmann equation in kinetic