many years, changes will take place which could not be foreseen. The editors deserve credit for their alertness towards new developments, and for their tolerance in accommodating them in the general plan of the treatise.

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Chemistry

Molten Salt Chemistry. Milton Blander, Ed. Interscience (Wiley), New York, 1964. x + 775 pp. Illus. $25.

During the past decade a resurgence of interest in molten salts was sparked by the increasing importance of high-temperature technology in general and by the needs of nuclear technology in particular. Although several short review articles and a couple of specialized monographs have been published, there is no general treatise comparable to this present volume.

Milton Blander, the editor, has successfully interwoven, within one volume, authoritative discussions of ten significant aspects of molten salt chemistry, presented by experts who themselves have made important contributions in the field. Throughout the book, emphasis is placed on the structure and thermodynamics of molten salt systems, as the following chapter titles indicate: "Equilibrium theory of pure fused salts," Frank H. Stillinger, Jr.; "Diffraction studies of the structure of molten salts," H. A. Levy and M. D. Danford; "Thermodynamic properties of molten salt solutions," Milton Blander; "Phase diagrams of fused salts," John E. Ricci; "Mixtures of metals with molten salts," M. A. Bredig; "Electronic absorption spectra of molten salts," G. Pedro Smith; "Vibrational spectra of molten salts," David W. James; and "Metal halide vapors: Structures and thermochemistry," S. H. Bauer and R. F. Porter. In addition, there is a fine chapter by Klemm on transport properties, including viscous flow, diffusion, and conductivity. The concluding chapter is a definitive exposition (by Liu, Johnson, and Laitinen) of electroanalytical chemistry in molten salts.

One might wish that there were a unified presentation of chemical reactions in molten salts and discussion of how they might be used for synthetic and other purposes. Of course, aspects of chemical reactivity are touched on in several chapters. Deviations from ideal behavior are discussed in some detail, and the question of whether nonideal behavior does or does not indicate the existence of complex ions is considered. This is not a source book of facts about molten salts but a broadly based exposition of fundamental concepts. In general, one will not find details about applications to various technological problems. However, there is much information about important specific chemical systems, especially in the chapters on phase diagrams, metals in melts, and electroanalytical chemistry.

Molten Salt Chemistry is certainly timely and a must in the library of every serious worker in the field of fused salts. This thought-provoking book, well documented with exhaustive reference lists, will suggest important future research and provide excellent collateral reading for advanced students of physical and inorganic chemistry. I warmly recommend it to libraries of chemistry and related technological areas.

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Inorganic Chemistry

Handbook of Preparative Inorganic Chemistry. vol. 1. Georg Brauer, Ed. Translated from the German edition (Stuttgart, ed. 2, 1960) by Scripta Technica. Reed F. Riley, Ed. Academic Press, New York, 1963. xxviii + 1002 pp. Illus. $36.

This translation of volume 1 of Brauer's *Handbuch* is a welcome addition to the reference literature of the English-speaking inorganic chemist. The translators have Americanized the work by removing the references to German suppliers, trade names, and glass and ground-glass joint sizes and substituting the American equivalents. They have improved the nomenclature and revised or omitted certain brief sections. All references to "liquid air" have been changed to "liquid nitrogen." A precautionary note (p. 44) has been added regarding the hazards of using liquefied air or oxygen as laboratory coolants, but the fact that the condensation of atmospheric oxygen in any open container of liquid nitrogen effectively converts it into liquid air is not mentioned.

This work contains contributions by a group of experienced German chemists who have exercised great care in selecting only those synthetic procedures that have been tested and confirmed in the laboratory. Part 1, Preparative Methods, by P. W. Schenk and G. Brauer, provides an excellent description of special methods and devices for preparative inorganic chemistry. This part will be particularly valuable to the novice in inorganic laboratory work because it contains descriptions of many of the more subtle aspects of laboratory technique, aspects that often make the difference between a good result and a mediocre one.

Part 2, Elements and Compounds, is divided into 18 sections, each devoted to compounds for a particular element or group of related elements. The coverage includes most of the elements in the periodic table, exclusive of the transition series and the rare gases. Compounds of the transition elements along with special classes of substances are considered in volume 2, which is now being translated.

The translation is well done, and it is without significant errors. However, misprints are inevitable in a volume of this size. For example, on page 218, the boiling point and density of PbF_2 are listed as 129°C and 824, respectively, but they should be 1293°C and 8.24.

The book is clearly printed and will be easy to read. It is valuable because it brings together the methods for preparing several hundred inorganic compounds.

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Nuclear Structure

Nuclear Theory. Pairing force correlations and collective motion. A. M. Lane. Benjamin, New York, 1964. xii + 250 pp. Illus. Paper, $4.95; cloth, $8.

Some 6 years ago Bohr, Mottelson, and Pines suggested a possible analogy between the energy gap displayed by superconducting metals and the excitation spectra of atomic nuclei. This speculation has led to a new theory of nuclear structure, which is rich in physical content. Although this theory is based on the familiar shell model, it uses field theoretic methods new to nuclear structure and has developed a terminology all its own. Unfortunately, this has made the field difficult to study.

Now at last we have a treatment of the subject which should make it far more accessible to students. In this book Lane presupposes a knowledge of nuclear shell structure and some familiarity with field theory. With these tools the role of the pairing forces in producing an energy gap, and the subsequent effect on collective motions, is thoroughly investigated.

The text is presented in two parts, with separate bibliographies for each. The first part is devoted to explaining how the pairing force comes about, and then to comparing the results with the experimental features of nuclei. The second part develops the theory of the collective motion, with strong emphasis on the random phase approximation. Very little is said about the effect of long range (P_2) forces, and no time is devoted to Elliott's work on SU_3. The bibliography is excellent, and a few of the most significant papers are reprinted at the end of the book.

The book was prepared as a series of lectures delivered at Harwell in 1962. Like most volumes of lecture notes, it contains quite a few misprints. But these should merely tend to sharpen the attention of the careful reader, for they are not serious. Theoretical students and lecturers will find this book of great value. Experimentalists will probably want to skip a large number of theoretical sections that make frequent use of such sophisticated mathematical tools as Wick's theorem.

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Analytical Chemistry

Ionic Equilibrium. A mathematical approach. James Newton Butler. Addison-Wesley, Reading, Mass., 1964. xii + 547 pp. Illus. $8.75.

This is an amazingly good book. Butler has written clearly and brilliantly about a difficult subject, and it is obvious that he has thoroughly enjoyed doing so. The reader cannot help sharing his enthusiasm.

Right from the beginning the author declares his intention of unmasking the "hidden assumptions" common in analytical textbooks. He discusses complex equilibria and nonideality of electrolytes briefly in the first two chapters and in more detail later on. He presents the calculation of ionic equilibrium as an exercise in the art of mathematical approximation, and this theme runs through the book. First, of course, he states explicitly the conditions of mass balance, charge balance (or, as an alternative, the "proton condition"), and the free energy balances for the several equilibria and shows how exact equations for the hydrogen-ion concentration (and for other significant concentrations) can be derived. He then attacks the problem of solving high-order polynomials and explains Newton's approximation method as well as graphical and other methods. The most valuable method of all—"chemical intuition" followed by backchecking—is given the prominence that it deserves.

In chapter 5, on weak monoprotic acids and bases, there is a particularly good explanation of how approximations are made in practice. A logarithmic *p*H-concentration diagram illustrates the various approximations used to calculate the *p*H of a solution of a weak acid, and those concerned with *p*H-titration curves are carefully explained.

Logarithmic diagrams and semilogarithmic distribution curves are used to advantage throughout the book, and the discussion covers many different types of systems, including polyprotic acids, precipitation, complex-ion, and oxidation-reduction systems. The steepness of acid-base titration curves or "buffer index" is discussed in detail, and in this discussion the carping critic might recognize one trifling error—the equivalence point in titrating a weak acid with a strong base does *not* quite coincide with the point of maximum slope of the *p*H-titration curve, though the difference is negligibly small.

The author mentions many topics—among them the study of fast reactions by Max Eigen, Harned and Owen's measurements of ionization constants, Bates' study of *p*H scales, and Sillén's work on hydrolysis of metal ions. To some he gives more space than to others, but he always gives references; a distinctive feature of this book is the sentence or two of comment that accompanies every single reference cited—and there are many references. There are also many numerical problems, most of them having real practical interest.

The University of British Columbia lost an outstanding teacher when Butler decided to go into industry.

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Mathematics

Topics in Mathematics. 15 booklets: *Algorithms and Automatic Computing Machines* (112 pp.), B. A. Trakhtenbrot; *Areas and Logarithms* (56 pp.), A. I. Markushevich; *Computation of Areas of Oriented Figures* (64 pp.), A. M. Lopshits; *Configuration Theorems* (48 pp.), B. I. Argunov and L. A. Skornyakov; *Equivalent and Equidecomposable Figures* (80 pp.), V. G. Boltyanskii; *The Fibonacci Numbers* (56 pp.), N. N. Vorobyov; *How to Construct Graphs*, G. E. Shilov, and *Simplest Maxima and Minima Problems* (64 pp.), I. P. Natanson; *Hyperbolic Functions* (63 pp.), V. G. Shervatov; *Induction in Geometry* (112 pp.), L. I. Golovina and I. M. Yaglom; *An Introduction to the Theory of Games* (72 pp.), E. S. Venttsel'; *The Method of Mathematical Induction* (56 pp.), I. S. Sominskii; *Mistakes in Geometric Proofs* (64 pp.), Ya. S. Dubnov; *Proof in Geometry* (64 pp.), A. I. Fetisov; *Summation of Infinitely Small Quantities* (72 pp.), I. P. Natanson; *What Is Linear Programming?* (96 pp.), A. S. Barsov. Alfred L. Putnam and Izaak Wirszup, Eds. Published for Survey of Recent East European Mathematical Literature by Heath, Boston, 1963. $1.40 each.

These booklets were translated from the "Popular Lectures in Mathematics," a series of lectures delivered by well-known Russian mathematicians to groups of secondary school students in Leningrad, Moscow, and other Russian cities. The purposes of the booklets, which vary in size from about 50 to 120 pages, are ". . . to introduce the reader to various aspects of mathematical thought and to engage him in