

factors which govern their specificity. From the time of the discovery of the pneumococcal polysaccharides, the school of Avery was deeply concerned with the question of the relationship between specificity and the structure of carbohydrates. Some very pertinent and fundamental facts were disclosed in this regard during the ensuing decade, yet little or no mention is made of them here. Furthermore, the excellent and fundamental work of Kabat, dealing with the relationship between the specificity of dextrans and other polysaccharides and the size of the combining sites of anti-polysaccharide antibody, is not even mentioned. The few hundred words of discussion pertaining to the biological activity of bacterial polysaccharides, found at the end of the third chapter, are woefully inadequate.

In sum, it might be said that "Polysaccharides of Micro-organisms" is a book for chemists or for microbiologists who wish to learn something of the chemistry of the microbial agents with which they are working. It is a good summation of our more modern information regarding the chemistry of these agents, but it is a book written from a very restricted point of view. It offers but little insight into the great vistas which have been opened in the field of modern immuno-chemistry since the discovery of specific bacterial polysaccharides. Those who wish to know more of the immunological aspects of these important agents will have to read elsewhere.

THE ROCKEFELLER INSTITUTE  
NEW YORK 21, N. Y.

WALTHER F. GOEBEL

**Transport Phenomena.** By R. BYRON BIRD, WARREN E. STEWART and EDWIN N. LIGHTFOOT, Department of Chemical Engineering, University of Wisconsin, Madison, Wisconsin. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1960. xxi + 780 pp. 15.5 × 23.5 cm. Price, \$13.75.

Over the last several years the undergraduate chemical engineering curriculum at many schools has undergone rather extensive revision, with additional courses in basic science and advanced mathematics replacing many of the more traditional courses in design and technology. This book dramatically reflects this trend and it is destined to have a far reaching effect on chemical engineering education.

The central feature of the book is the parallel development of the three transport processes, covering the subjects of momentum transport (viscous flow), energy transport (heat conduction, convection and radiation) and mass transport (diffusion). These topics have been organized in such a manner that the book is divided into three major parts, each of which covers a particular transport process. Within each part the material is further subdivided into chapters based on the type of transport, *e.g.*, transport by molecular motion, transport in an arbitrary continuum (the equations of change), transport in turbulent flow, interphase transport. The organization of the material very effectively emphasizes the analogies which exist among the various transport phenomena.

Several items are worthy of special mention. First, the method of presentation is more rigorous and mathematical than has been common in chemical engineering text-books. Second, much of the material, such as the treatment of non-Newtonian fluid dynamics and several of the topics covered in the section on mass transport, appears for the first time in text-book form. Third, the authors have given a systematic and thorough derivation of many of the equations used in chemical engineering analysis. Pertinent examples are the definitions of the interphase transfer coefficients and the development of the macroscopic momentum, energy and mass balances. Also, the book contains a wealth of illustrative examples and problems.

The authors have suggested that most of the topics in this book may be suitably covered in a three- or four-credit introductory course. It is the opinion of the reviewer that a course of at least twice the suggested length will be required for the average student to obtain a real grasp of the material. For example, the first section of the book, "Momentum Transport," contains material equivalent to an introductory course in fluid dynamics. Much of the book could be used very profitably in conjunction with the ordinary unit operations courses.

The book has been carefully planned and the writing is exemplary. The authors have successfully accomplished

their purpose in presenting transport phenomena "as one of the key engineering sciences." Without question "Transport Phenomena" will become a standard in the chemical engineering field.

DEPARTMENT OF CHEMISTRY AND  
CHEMICAL ENGINEERING  
UNIVERSITY OF ILLINOIS  
URBANA, ILLINOIS

J. A. QUINN

**Synthetic Inorganic Chemistry.** By WILLIAM L. JOLLY, Associate Professor of Chemistry, University of California, Berkeley. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1960. ix + 196 pp. 15.5 × 23.5 cm. Price: Trade Edition, \$8.00; Text Edition for Classroom Adoption, \$6.00.

In paragraph two of the preface to this book, Dr. Jolly states his philosophy and approach toward synthetic inorganic chemistry. "The main purpose of a course in inorganic preparations should be to awaken synthetic talents in students. The student should be taught both theoretical principles and laboratory technique. He should prepare unusual, "exotic" compounds that may spark his curiosity and make him wonder about non-existent compounds." It is most gratifying to see that the author was able to write just such a book. In the limited space of this rather small book, the author has been able to mention many of the recent and more exciting developments in synthetic inorganic chemistry. These are described in such a way as to point out the fundamental significance of synthetic chemistry and to stimulate the student in this direction.

The book is definitely not a "cook book" type of inorganic preparations. The first five chapters deal with the theoretical principles of synthesis which includes such things as the significance of considerations of thermodynamic, kinetic, and acid-base phenomena. Following this there are ten chapters on laboratory technique which include electrolytic synthesis, high-temperature processes, inert atmosphere box, vacuum line, electrical discharge tubes, non-aqueous solvents, ion-exchange columns, autoclave, and liquid-liquid extractions. Excellent illustrations and detailed discussions are given for these techniques. The final chapter gives specific directions for eighteen syntheses which vary in time required and degree of difficulty from copper(I) chloride, the easiest, to ferrocene, the most difficult. These syntheses were chosen to illustrate the special techniques discussed in the previous chapters.

This book is enthusiastically recommended for chemistry students and for teachers of inorganic chemistry. It provides a stimulus for the need for synthetic chemistry by citing specific examples (with references) from the current chemical literature. Thought-provoking questions and problems are asked at the end of several of the chapters. Finally, the reviewer is prompted to suggest that the book be required reading for the members of the Committee on Professional Training of the American Chemical Society. This should convince even the most skeptic of skeptics that general chemistry is *not* inorganic chemistry.

DEPARTMENT OF CHEMISTRY  
NORTHWESTERN UNIVERSITY  
EVANSTON, ILLINOIS

FRED BASOLO

**Imperfections in Crystals.** By H. G. VAN BUEREN, Philips Research Laboratories, Eindhoven. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. xviii + 676 pp. 16.5 × 23 cm. Price, \$16.75.

Although a large fraction of the solids composing the earth's crust are crystalline in structure, many of these materials owe their peculiarities of mechanical or physical behavior to departures from uniform crystalline regularity. Therefore the science of solids is in an appreciable measure the study of what may be called imperfections of crystal structure.

The book under review is a comprehensive and thorough survey of the present status of theory and observation concerning the nature and effects of point and line structural imperfections in a restricted class of solids. It is concerned chiefly with the study of dislocations, vacancies, interstitial atoms, and the interaction of these defects in combination. The influence of these structures upon the

mechanical and physical properties of solids, chiefly metals, is recounted from a mathematical and physical point of view.

The book is divided into three major sections. Part I reviews the physical theory of crystalline solids, describes the geometrical and structural character of crystal imperfections of interest and includes an exposition of the mathematical theory of elasticity, and the elastic theory of dislocations. Part II describes observational methods and the metallography of dislocations, and comprises a lengthy and thoroughgoing treatment of the dislocation theory of the mechanical deformation of crystals, with the emphasis being placed upon metallic deformation. The topical content of the work is comparable to that of the 1943 volume, "Structure of Metals," of C. S. Barrett, but is thoroughly cognizant of modern work up to 1959. Part III discusses imperfections in non-metallic crystals, and includes chapters on electrical and optical properties of ionic and covalent crystals, electrical and structural imperfections in the semiconductors germanium and silicon, and concludes with the plastic deformation and irradiation of diamond-structure materials and defect diffusion and internal friction in germanium and silicon. Each of the thirty one chapters of the book is followed by a bibliography of references to pertinent literature. The author's style is eminently readable if occasionally verbose and repetitious. He acknowledges the formulative and controversial state of some aspects of the science. Individual examples of his facility for discussing opposing or complementary points of view occur in the short chapter on the production of imperfections during plastic deformation, and in a chapter on the physical observation of defects in which debated issues and open questions concerning the interpretation of conductivity measurements and of the recovery from radiation damage are lucidly discussed.

"Imperfections in Crystals" is notable for its breadth of coverage of its chosen field. Each chapter is nearly complete within itself. Although some redundancy is thus inevitable, it should hence prove a useful source for rapid reference concerning special aspects of the behavior of imperfections in crystalline solids.

DEPT. OF ELECTRICAL ENGINEERING  
PENNSYLVANIA STATE UNIVERSITY  
UNIVERSITY PARK, PENNSYLVANIA

H. A. ATWATER

**Medicinal Chemistry.** Second Edition. Edited by ALFRED BURGER, Professor of Chemistry, University of Virginia, Charlottesville. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. xiii + 1243 pp. 19 × 26 cm. Price, \$37.50.

The new edition of Burger's "Medicinal Chemistry" has been anxiously awaited by workers in this field and now belongs squarely on the shelf between the books on organic chemistry and books on pharmacology. It is a compendium of useful information to those interested in the subject of drugs and provides "the" means of making a rapid and moderately comprehensive survey of a number of diversified areas.

In contrast to the original edition, the new edition is a collaborative effort of Dr. Burger and thirty-four specialists. However, twenty-two of the fifty-five chapters are written by the senior author. The book itself has more than doubled in size and, unfortunately, publication costs have increased correspondingly.

The organizational pattern has remained essentially the same and the four main topics are: (1) fundamental aspects of medicinal chemistry, (2) pharmacodynamic agents, (3) vitamins and hormones, and (4) chemotherapy. The primary approach to these subjects is from the chemical standpoint. Any criticism of this approach has been deftly anticipated by the editor in his introductory chapter. However, one is left with the impression that there is an over-emphasis on organic chemistry, an under-emphasis on screening methodology, and a sparcity of structure-activity data. The space covered by the various chapters is often unrelated to the importance of the subject matter and one

wonders what perspective the uninitiated might achieve upon reading the book.

Some twelve topics not covered in the original edition have been added. Some of the new chapter headings are: "Neuropharmacology," "Psychopharmacologicals," "Drug for Hyperkinetic Disorders and Muscle Relaxants," "Ganglionic Blocking Agents" and "Hypotensive Drugs." Of the older topics which have been revised and brought up to date, particularly comprehensive are the chapters on: "The Vitamins" by A. Wagner and K. Folkers, "The Steroid Hormones" by W. Nes, and "Antibiotics" by M. Rebstock.

The effort to capture, even momentarily, the literature of such a rapidly expanding field is unquestionably a painstaking task for which the users of this book will be appreciative. The unavoidable delay from manuscript to printing necessarily dates such a work before it is completed. Projecting the third edition ten years in advance, one is impressed with the enormity of the task. Perhaps medicinal chemistry is reaching a state of maturity and justifies a yearly publication that would periodically review various topics of interest. Certainly, Dr. Burger is eminently qualified to organize such an effort.

RESEARCH DIVISION  
THE S. E. MASSENGILL CO.  
BRISTOL, TENNESSEE

MAX V. SIGAL, JR.

**Gmelins Handbuch der Anorganischen Chemie. Achte Völlig Neu Bearbeitete Auflage. Strontium. Ergänzungsband. System-Nummer 29.** Edited by E. H. ERICH PIETSCH. Verlag Chemie, G.m.b.H., Pappelallee 3, Weinheim/Bergstr., Germany. 1960. xxx + 306 pp. 17.5 × 25.5 cm. Price, \$46.50 (in wrappers); \$47.50 (cloth bound).

**Gmelins Handbuch der Anorganischen Chemie. Achte Völlig Neu Bearbeitete Auflage. Barium. Ergänzungsband. System-Nummer 30.** Edited by E. H. ERICH PIETSCH. Verlag Chemie, G.m.b.H., Pappelallee 3, Weinheim/Bergstr., Germany. 1960. xlv + 569 pp. 17.5 × 25.5 cm. Price, \$84.50 (in wrappers); \$85.50 (cloth bound).

These two volumes continue the same outstanding tradition which made "Gmelins Handbuch" the most valuable reference work in inorganic chemistry.

The volumes cover natural occurrence of the elements (including extraterrestrial occurrence), geochemistry, mineralogy, preparation and properties of the elements, their physiological properties and the detailed discussion on the preparation and properties of most of the inorganic compounds containing these elements. It is perhaps unfortunate that the organometallic complexes are not included in the discussion.

Literature search seems to be as complete as humanly possible and even obscure publications do not escape notice. It is, however, somewhat surprising that according to the title page, the literature has been covered only through 1949, although in the text one does find occasional references to later publications up to 1955. It seems that for volumes published in 1960 a more complete coverage of recent literature should have been possible.

The usefulness of the new edition is enhanced by an English table of contents and by translations of sub-titles throughout the text. In addition, a concise and clear style of writing makes Gmelin readily accessible to chemists with only a very slight knowledge of the German language.

While the two volumes do not have indices, this lack is partially remedied by a very detailed table of contents.

The high price of these volumes will probably keep them from the bookshelves of an average chemist, but it is difficult to imagine a chemistry laboratory without a complete collection of the "Gmelin Handbuch."

DEPARTMENT OF CHEMISTRY  
NORTHERN ILLINOIS UNIVERSITY  
DEKALB, ILLINOIS

ALEXANDER I. POPOV