

The first four chapters of the book are devoted to outlining the theoretical principles needed. These include the Lewis octet theory, bond polarity, atomic orbitals, molecular orbitals, heterolytic and homolytic fission, nucleophilic and electrophilic reagents and the four modes of intramolecular electronic displacement used by the English School. The remainder of the book is given over to the organization of organic chemistry in terms of the electronic theory. Chapters V to XI deal with nucleophilic substitution reactions at saturated carbon, elimination reactions, additions to unsaturated compounds, tautomerism, esterification, hydrolysis of esters, aromatic substitution and saturated rearrangements. These chapters include many examples of experimental data which show accord with theoretical predictions of the effect of substituents or of alteration of the thermodynamic environment on the equilibria, rates and courses of chemical reactions. It is rather surprising that he consistently relates changes of electron density to rate constants without any hint that this procedure involves the neglect of the entropy of activation which only too frequently outweighs the activation energy in determining the rate constant.

I would stoutly defend Dr. Baker's right to decide which subject matter is to be included in his book and which is to be ignored. But I would also stoutly maintain that the prospective reader of the book has the right to know which subjects, of those pertinent to the field covered, are omitted. With this in mind, it might be mentioned that, with the sole exception of the contributions made by Lewis and Pauling to theories of atomic and molecular structure, no mention is made of any basic electronic principles contributed by Americans. Thus, one finds no mention of the neighboring group theory or of the various stereochemical principles developed in our country nor is the theory of concerted (push-pull) reactions employed as a general principle, although in the Chapter dealing with tautomerism one concerted reaction is quite incidentally included. It is, perhaps, also significant that in the lists of suggested further reading to be found at the end of each chapter all references except one are to papers by English authors.

This book on the electronic theory of the English School is highly recommended to all chemists interested in theoretical organic chemistry. Those approaching the subject for the first time will find it an authoritative and clear introduction to the subject; those already acquainted with the field will find it an aesthetic delight of perfect organization and an excellent review.

DEPARTMENT OF CHEMISTRY
WAYNE STATE UNIVERSITY
DETROIT, MICHIGAN

A. EDWARD REMICK

Chemical Analysis. Volume VIII. Colorimetric Determination of Nonmetals. Editor, DAVID F. BOLTZ. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1958. xii + 372 pp. 16 × 23.5 cm. Price, \$8.50.

This book may be considered a companion volume to the well-known monograph by Sandell on the "Colorimetric Determination of Traces of Metals" published in 1944 as Volume III of this Series; a second edition, revised and enlarged, appeared in 1950; the third edition is scheduled to be published late in 1958 or early 1959. Because of the success and popularity of Sandell's book it seemed advisable to make available a supplemental one devoted to the nonmetals.

Volume VIII of this Series is a collective monograph to which fourteen authors have contributed "the colorimetric methods, based upon their experiences and/or judgment, which they believe to be the most suitable." There are eleven chapters as follows: Chapter I (D. F. Boltz), Principles and Practices in Colorimetric Analysis; Chapter II (D. F. Boltz and C. H. Lueck), Phosphorus; Chapter III (G. V. Potter), Silicon; Chapter IV (M. J. Taras), Nitrogen as Ammonia, Nitrite and Nitrate; Chapter V (D. F. Boltz and W. J. Holland), Chlorine; Chapter VI (E. R. Wright, R. A. Smith and S. Black), Bromine; Chapter VII (B. Zak), Iodine; Chapter VIII (S. Megregian), Fluorine; Chapter IX (G. D. Patterson, Jr.), Sulfur; Chapter X (R. A. Johnston), Tellurium and Selenium; and Chapter XI (G. Porter and R. C. Shubert), Boron. The editor has followed the

same style and order of presentation of subject matter as used by Sandell; *i.e.*, separations, methods of determination, and applications. Three to eleven methods are given for each of the eleven nonmetals and each chapter has an extensive bibliography at the end, there being a total of 718 references. The book is well illustrated with figures and graphs, and a transmittance-absorbance conversion table is given as an Appendix. Author and Subject Indexes conclude the book.

The printing, paper and binding are good. The monograph will make a useful companion to Sandell's "Colorimetric Determinations of Traces of Metals."

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF VIRGINIA
CHARLOTTESVILLE, VIRGINIA

JOHN H. YOE

Dislocations and Mechanical Properties of Crystals. An International Conference held at Lake Placid, September 6-8, 1956. Sponsored by Air Force Office of Scientific Research, Air Research and Development Command, and the General Electric Research Laboratory. Editors: J. C. FISHER, W. G. JOHNSTON, R. THOMSON and T. VREELAND, JR. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1957. xiv + 634 pp. 16 × 23.5 cm. Price, \$15.00.

Dislocations were invented some 30 years ago to explain the low strength of crystalline solids compared to theoretical estimates. Although occasional experimental results appeared in the intervening time, it is only within the last ten years or so that direct proof of the existence of dislocations has been obtained. Many theoretical concepts have been justified and new experimental results have given fresh impetus to theoretical work. This book appears at a particularly appropriate and interesting time for dislocation theory. Quoting from the foreword: "Perhaps the most striking contribution to the conference dealt with the observation of dislocations, which formed the subject of the first morning's discussion. Photographs of dislocations, slipband formation, Frank-Read sources, prismatic dislocations, and even motion pictures of dislocation motion were shown. Here was remarkable and breathtaking confirmation of much previous theoretical work, and a wealth of new experimental material which has given the experimentalist a period of supremacy."

This book includes the proceedings, discussions and post-conference remarks of a small international conference on the mechanical aspects of dislocations. Forty-two papers, covering a wide range of interest, are presented by a cross-section of excellent investigators. The material covered is not only required reading for anyone immediately interested in mechanical properties, but might well be used by others as an initiation into the rapidly evolving field. Much significant recent work is covered and the bibliographies are extensive and include the necessary background material.

The book has been divided into eight sections: I. Direct Observation of Dislocations; II. Deformation of Pure Single Crystals; III. Work Hardening and Recovery; IV. Alloy Crystals, Impurities, Yield Point Phenomena; V. Dislocation Damping and Fatigue; VI. Theory of Dislocations; VII. Whiskers and Thin Crystals; and VIII. Radiation Damage. The classification of papers under these headings is necessarily somewhat arbitrary since material included in any particular section often contains information that would apply to other sections. Some duplication naturally occurs but is usually a matter of complementary work.

Since the large number of papers precludes reporting on all, discussion will somewhat arbitrarily be limited to those aspects that appear to the reviewer to be of most general interest.

Section I includes many striking photographs of dislocations and dislocation etch pits brought out by diverse techniques. S. Amelinckx considers the mechanism of decoration of dislocations by precipitated particles and includes photographs of different types of dislocation networks brought out by this technique in transparent crystals. W. C. Dash observed decorated dislocations in silicon using an infrared image tube in conjunction with a microscope. Hirsch, Horne and Whelan show photographs of dislocations observed by transmission electron microscopy on thin foils of aluminum. Results of etching techniques are pre-

seuted by Gilman and Johnston as part of their continuing investigations of lithium fluoride crystals.

Section II contains papers which consider stress-strain curves obtained on single crystals of various materials and their correlation with the nature of slip in the region of plastic flow. Blewitt, Coltman and Redman present the results of deformation of copper at 4.2°K., at which temperature they find discontinuous slip and deformation by twinning.

Section III, being mostly theory of plastic deformation, is notable for the inclusion, after the conference, of an excellent extensive and well-organized treatment of the mechanism of glide and work-hardening by A. Seeger. In addition to work-hardening and recovery, this paper contains theoretical material applicable to all aspects of mechanical properties.

Section IV is concerned mainly with theories of "locking" and "pinning" of dislocations, as applied to deformation, yield, annealing, etc.

Section V contains three papers on the application of dislocation theory to damping and fatigue.

The papers in the rather short Section VI treat some aspects of the theory of dislocations, including their generation and motion. One would like to have found greater coverage here, particularly to the extent that this volume can be considered as a source book.

In addition to further information on the by now well-known high strength of whiskers, Section VII contains interesting results of Read and Pearson on deformation and fracture of silicon rods and whiskers and of Suzuki, Ikeda and Takeuchi on deformation of thin metal crystals in which an increase in strength is noted as size decreases.

Section VIII contains several papers on a few subjects from the complex and as yet little-understood phenomena of radiation damage. Koehler, Henderson and Bredt present a brief survey of annealing data in noble metals in which each of six stages of annealing is analyzed in terms of some atomic process. Blewitt, Coltman, Holmes and Noggle present the experimental results and analyses of some excellent data on the mechanism of annealing in neutron irradiated metals. Both articles show that, in order to understand the mechanism of annealing at all, the process must be followed through the full range of temperature up from the preferably low temperature of irradiation (just above liquid helium).

NATIONAL CARBON RESEARCH LABORATORIES
PARMA, OHIO

R. M. BROUDY

A Manual of Paper Chromatography and Paper Electrophoresis, Second Edition, Revised and Enlarged. By RICHARD J. BLOCK, Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y., and Department of Biochemistry, New York Medical College, New York, N. Y.; EMMETT L. DURRUM, Associate Research Director, Spinco Division, Beckman Instruments, Inc., Palo Alto, California; Associate Clinical Professor of Medical Microbiology, Stanford University School of Medicine, Palo Alto, California; and GUNTER ZWEIF, Associate Chemist, Pesticide Residue Research Project, University of California, Davis, California. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. 1958. xi + 710 pp. 16 × 23.5 cm. Price, \$12.80.

Chromatographic and electrophoretic separations on paper have been in use for over a decade. Their simplicity and general applicability have elicited almost as many techniques as there are workers in the field. Stabilization and organization of this development can only be performed by an extensive and practical survey of progress such as Paper Chromatography and Paper Electrophoresis.

The structure of the 1955 First Edition is maintained but expanded in both sections from 484 to 710 pages and the copious references are increased by fifty per cent. From the standpoint of providing a reliable survey of applications the book is the best available reference source and can be recommended as a laboratory guide. The authors have been generous in their recommendations of other reviews and books on the subject. It is the digestion of the tremendous volume of literature, however, which constitutes the major contribution of this volume. The bibliographies include about 1800 references on paper chromatography and over 2100 on paper electrophoresis. The authors include photo-

graphs of commercially available chromatographic equipment. In general these are far superior to the equipment shown in the first edition. The reviewer feels more of the older figures could have been discarded without detracting from the value of the book.

The divisions are introduced by understandable and helpful discussions of principles and theories. The individual sections which deal with separation of classes of compounds also include reviews of pertinent publications on properties of homologous and other series. Quantitation principles and methods are stressed wherever practical. In many instances micro methods are given for determination of eluted compounds. Methods of inorganic ionography are surveyed but not as exhaustively as amino acid chromatography and protein electrophoresis. The treatment of high voltage paper electrophoresis is unfortunately brief in view of the potentialities and growing interest in the method. Continuous electrophoresis of proteins is especially well described. Since electrophoretic migration parameters are arbitrary Durrum stresses the necessity for methods of standardization of densitometric techniques.

Authors of chromatography monographs tend to overlook a major attribute of the method. Partition chromatography and electrophoresis demonstrate intensive properties of substances which the chemist may use for their characterization and for structure determination. Unknown substances are so often first recognized by paper chromatography that discussion of the philosophy and techniques of identifying unknowns might be greatly expanded. This would involve comparison of chemical and chromatographic properties of the groups of compounds as they are presently classified. Such a correlation together with the present discussions of variations of properties with structure within a group or series could extend the usefulness of the chromatographic method.

DEPARTMENT OF AGRICULTURAL
AND BIOLOGICAL CHEMISTRY
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PENNSYLVANIA

A. A. BENSON

Theory of Dielectrics. Dielectric Constant and Dielectric Loss. By H. FRÖHLICH, Professor of Theoretical Physics in the University of Liverpool. Oxford University Press, 114 Fifth Avenue, New York 11, N. Y. 1958. vii + 192 pp. 14.5 × 22 cm. Price, \$4.80.

The first hundred pages of text and thirty pages of appendices in this rather short monograph are devoted to systematic development of theories of dielectric constant and loss. The approach is largely based on classical statistical mechanics, and substantial parts are the results of investigations by the author. Applications to selected examples are taken up in the last fifty-five pages of text. The viewpoint is that of the theoretical physicist in much the same sense that "Dielectric Behavior and Structure" by C. P. Smyth deals largely with chemical implications, and "Dielectrics and Waves" by A. von Hippel is an exposition which puts more stress on engineering aspects.

The present second edition differs from the first only by the addition of several pages of appendix material to the text of the 1949 edition. Much of this is concerned with the author's approach to some rather subtle and recently disputatious points in the theory of the dielectric constant of substances with permanent dipoles and induced polarization; two final paragraphs outline recent dynamical treatments by Gross and Sack of dielectric loss when inertial effects must be considered.

A reader interested in becoming acquainted with statistical molecular treatments of dielectric behavior will find this book useful, with a considerable content for its small size. This reviewer's principal criticism is that except for the appendix material no developments since 1948 are mentioned. Of these there have been a considerable number of sufficient importance that to a significant extent the book now fails to "provide a background against which applications can be made" (the quotation is from the dust cover).

DEPARTMENT OF CHEMISTRY
BROWN UNIVERSITY
PROVIDENCE 12, RHODE ISLAND

ROBERT H. COLE