comprehensive, and the page numbers are in italics where tests concerning the compounds in question are described.

R. E. Oesper, well-known translater of Feigl's books, is to be congratulated for making "Spot Tests in Organic Analysis" available in clear and concise English. Printing and paper are good and the book has an attractive cloth binding.

This volume, together with its companion volume on "Spot Tests in Inorganic Analysis" (5th ed., 1958), is a useful and up-to-date source of information not only to analytical chemists but also to organic chemists, pharmaceutical chemists and biochemists, as well as to advanced students in chemistry as an aid to the performance of spot tests and to an understanding to the underlying chemistry. Research workers in analytical chemistry will find these two volumes stimulating and helpful.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF VIRGINIA JOHN H. YOE
CHARLOTTESVILLE, VIRGINIA

Comparative Effects on Radiation. Report of a Conference held in San Juan at the University of Puerto Rico, February 15–19, 1960, sponsored by National Academy of Sciences–National Research Council. Edited by MILTON BURTON, Chemistry Department and Radiation Laboratory, University of Notre Dame, J. S. KIRBY-SMITH, Biology Division, Oak Ridge National Laboratory, and JOHN L. MAGEE, Chemistry Department and Radiation Laboratory, University of Notre Dame. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1960. xx + 426 pp. 16 × 23 cm. Price, $8.50.

This symposium, held a little less than ten years after the prototype symposium at Oberlin, again brought physicists, chemists and biologists together to consider fundamental problems of the interaction of radiation with matter at various levels of organization and complexity. However, the similarity ceases here, except for some continuity of editorship. The primary theme for this conference was energy transfer. The papers by Fano, Kasha, Magee and Forster develop ways in which the exciton theory of electronic energy levels may be pertinent to the transfer of excitation from absorbed radiant energy in condensed molecular media. Kallmann presents an invited paper commenting on Forster's views and presenting data on energy transfer in rigid media. The paper by Hochanadel provides a useful (and to this reader a more definitive than some) summary of current thoughts on the radiolysis of water. Effects in organic systems are considered by Hamill (benzene and halogen compounds) and by Charlesby (polymers). The import of these phenomena for biological systems is covert except in the discussion sessions when some speculations are made. Correlation between events occurring in microseconds after energy adsorption and structural or functional defects measured from seconds to years after exposure has not yet developed. It is possible that these papers are pointing the way, however.

Structural changes in nucleic acids and their components as described by B. and A. Pullman provide a possible bridge *via* large molecules. In Hutchinson's chapter on radiation effects in monolayers the presentation is aimed at cellular function and produced a lively disputation on the interpretation of membrane and permeability effects in irradiated cells. An unexpected bonus appears in the discussion for this chapter in Platt's presentation of Szilard's theoretical ideas on potential "flip–flop" systems in the cell.

Experience with living systems is represented by Swanson's discussion contrasting the initial effects of different types of radiation, the mechanism of photorecovery as presented by Rupert (substantial progress has occurred), and photoresponsiveness mediated by the plant pigment phytochrome as discussed by Hendricks.

Whereas the Oberlin symposium volume provided quite general coverage of many areas, this volume is quite specialized, and is less appropriate for the general reader. This is consistent with the purposes of these NAS–NRC sponsored symposia (note also the Highland Park conferences). However, a direct concern with and knowledge of energy transfer processes will be prerequisite to a detailed understanding of many of the papers. Some of the data seem to be almost irrelevant to the theme, but adroit comments by the editors reveal their pertinence. The recorded discussions are carefully presented and edited and do much to give the chapters a feeling of purpose. Without these, the volume would be largely a collection of specialized, sometimes only vaguely related papers. With them, the progress of the last ten years and portents for the future in understanding the early events in irradiated systems are highlighted.

The format is pleasing and readable.

DEPARTMENT OF RADIATION BIOLOGY
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ROCHESTER 20, NEW YORK

Infrared Methods. Principles and Applications. By G. K. T. CONN, Department of Physics, University of Exeter, Exeter, England, and D. G. AVERY, Development and Engineering Group, United Kingdom Atomic Energy Authority, Capenhurst, England. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1960. viii + 203 pp. 16 × 23 cm. Price, $6.80.

This volume gives the operating characteristics and the physical properties of the components, materials and systems used in studying or measuring absorption spectra in the portion of the infrared region between 1 and 25 microns. A brief introduction to infrared studies prefaces the volume, which is divided into two sections.

The first section deals with the individual components, materials employed and the design of units of an infrared spectrometer. There are chapters on sources of radiation, optical materials, detectors, amplifiers, and dispersive systems. The second section of the book covers practical infrared spectroscopy and there are chapters on calibration of detectors, monochromator design, non-dispersive absorption instruments, and radiation pyrometry.

The book is well written, clear, and concise, with extensive references for each chapter; however, it is not clear for whom this book is intended. The title would be misleading to the analytical spectroscopist, as the scope of the book covers infrared instrumentation and deals primarily with the spectrometer. The book does not instruct in or review methods of analysis or interpretation of spectra; however, the material presented will give the analytical spectroscopist a comprehensive survey of the components of his spectrometer and a finer appreciation of the design of commercial instruments.

The design spectroscopist may find some sections oversimplified and others of academic interest only, but the collection of references and bibliographies for review may be of sufficient value to warrant adding to his library.

The student of science will find the book most instructive because of the detailed treatment of each subject. The book will serve well as an introduction to infrared studies because the subject matter presented has not been similarly covered in any prior publication.

The Practical Applications Section appeared to have been added to broaden the scope of the book; however, it is not extensive enough to be helpful or educational. The materal covered in this section has been better presented elsewhere.

In summary, the student or beginning spectroscopist will find the book most valuable; the analytical spectroscopist will find the book interesting and instructive in parts, while the design spectroscopist will probably value the book as a collection of references.

CELANESE CHEMICAL COMPANY
A DIVISION OF CELANESE
CORPORATION OF AMERICA R. C. WILKERSON
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Block and Graft Polymers. By WILLIAM J. BURLANT, Chemistry Department, Scientific Laboratory, Ford Motor Co., and ALLAN S. HOFFMAN, Assistant Professor of Chemical Engineering, Massachusetts Institute of Technology. Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1960. vi + 166 pp. 16 × 23.5 cm. Price, $7.95.

The interesting book on "Block and Graft Polymers" by Burlant and Hoffman appears to be addressed to nonspecialists interested in applications. The solution properties and mechanical behavior of various polymers belonging

to these classes of materials are discussed and the polymers of industrial importance are treated more thoroughly. A general survey of preparative methods is presented, and in the first chapters the synthetic methods are described in an order determined by the type of elementary reaction which initiates the process. Thus, the writers considered processes based on chain transfer, on radical addition to unsaturation centers which are available in suitable polymers (essentially in rubbers), and the methods which utilize the functional groups either present in the primary polymer or subsequently introduced into it to permit a grafting procedure. Later chapters are ordered according to techniques used in the preparation such as photolysis, radiolysis and mechanical treatment.

A number of interesting examples are found scattered throughout the book, and these add substantially to easy reading. The writers attempt also to provide the reader with the general background which is pertinent to the problems of grafting.

Unfortunately, there are also some shortcomings which need to be mentioned. The general organization of the book suffers from combining a review of synthetic methods with a description of the properties of the resulting polymers. It would be better to separate these two topics and, indeed, this arrangement would be more rational since the same material may be obtained by different routes. The introductory sections leave much to be desired. For example, the theory of addition polymerization, photochemistry or introduction to radiolysis are presented in a sketchy way and not clearly or precisely. Since these subjects are discussed intelligently and thoroughly in many excellent books and texts, it would be better to leave them out and to devote instead more time and space to the main subject of the book, namely, to graft and block polymers. In fact, this main topic of the monograph deserves a more comprehensive treatment. Too many problems were left without any attempt at clarification or possible explanation. There are cases when explanations of the discussed phenomena are known, although the writers apparently were not aware of them. For example, the autocatalytic polymerization of gelled polybutadiene, mentioned as an unexplained feature of the reaction, is probably due to chain rupture caused by the swelling process.

The general impression is that the book was written hastily and the material not too well digested. There are a few errors, for example, some wrong chemical formulas, misspelling of names, etc. It is also strange to notice that the writers were very consistent in removing the second initial of the authors when quoted in the bibliography. In one place the reference is to a Belgian Patent without mentioning even the author's name either in the text or in the reference. It appears that an excellent opportunity for discussing fundamentals of block and graft polymers formation may have been missed.

STATE UNIVERSITY COLLEGE OF FORESTRY
AT SYRACUSE UNIVERSITY MICHAEL SZWARC
SYRACUSE, NEW YORK

Advances in Fluorine Chemistry. Volume I. Edited by M. STACEY, F.R.S., Mason Professor and Head of Department of Chemistry, University of Birmingham, J. C. TATLOW, Ph.D., D.Sc., Professor of Organic Chemisitry, University of Birmingham, and A. G. SHARPE, M.A., Ph.D., University Lecturer in Chemistry, Cambridge. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1960. vii + 203 pp. 16 × 25 cm. Price, $8.00.

Advances in fluorine chemistry have been accelerating for many years and especially since active work in this area began as a part of the Manhattan District program for the development of the atomic bomb. There is no doubt that the latter program was the main stimulus to active academic as well as industrial research in this important field. The advances have been made in most all areas, including organic, inorganic and industrial chemistry, with other areas such as biological chemistry enjoying their fair share. The authors of the book on "Advances in Fluorine Chemistry" admit that in spite of desperate efforts to write a textbook of fluorine chemistry with special reference to organic fluorine compounds, the task has been beyond them because of the output of original contribution. In a field growing as rapidly as fluorine chemistry, it is inconceivable that a book covering the recent advances can be realized.

The present book covering five chapters appears to have no particular theme except that of perhaps the primary interests of the authors involved. However, a great deal of material is included in these areas. Substantially all of the material in the five chapters is specifically over inorganic materials with special reference to use in the synthesis of fluorine-containing organic compounds.

The chapter on Halogen Fluorides by Musgrave is a good review of the literature on the preparation of halogen fluorides, including representative examples of attempts to make use of these materials as fluorinating agents. In spite of the fact that many investigators have attempted to make use of the halogen fluorides as fluorinating agents, few if any of the results stand out as particularly significant in the preparation of organic fluorine compounds. The author fails to devote much space to a discussion of the shortcomings of the halogen fluorides as reagents for preparative or industrial use. Bromine trifluoride, as pointed out, has been available commercially but little discussion seems to be given of the use made of the commercial material. Likewise, the potential for chlorine trifluoride seems to be overlooked.

Transition Metal Fluorides and Their Complexes is exceedingly well covered by the author, Sharpe. A great deal of work has been done with transition metal fluorides, especially their preparation and their properties. These metal fluorides, as would be expected from many complex fluorides, have been actively investigated. Unlike three of the chapters, this portion of the book has little or no significance in the preparation of organic fluorine compounds.

Fluoroboric Acids and Their Derivatives have been extensively investigated for many years. Bromine trifluoride, an important compound in the formation of the fluoroborates, has been an important reagent to both organic and inorganic chemists for many years, primarily because of its ability to complex with many other substances and its interest in catalysis. The author discusses in considerable detail the tetrafluoroborate ion, including an extensive review of tetrafluoroboric acid. Tetrafluoroborates have been of considerable interest and the review seems to be rather complete. Subsequent to the discussion on the tetrafluoroborate ion, the author discusses the tetrafluoroborates by groups, *i.e.*, groups 2A, 3A, etc. Anyone interested in tetrafluoroborates would find this chapter invaluable.

The Electrochemical Process for the Synthesis of Fluoroorganic Compounds has been reviewed on several occasions. The authors Burdon and Tatlow again give a comprehensive review of the process, discussing not only the apparatus used but also the operating conditions. It is pointed out that the process has limitations. For example, one of the limiting factors in the fluorination of hydrocarbons is the low solubility of these substances in hydrogen fluoride. In addition, the resulting solutions are non-conducting. There are means of partially overcoming these difficulties with the hydrocarbons and their halogenated derivatives. Ethers are reported to be fluorinated readily and in high yields by the electrochemical method. This has been an area of considerable industrial interest. Other types of organic compounds such as amines, carboxylic acids and sulfur compounds are discussed. Many of these materials do not survive the electrochemical fluorination process without substantial change, usually fission of the basic structure. The authors make an attempt to interpret the mechanism for the process, but it seems at best only postulated mechanisms are feasible at this time. The authors point out that the process yields and ratios of products often vary except in a limited number of classes of compounds. Very little attention is given in the chapter to the present commercial status of the process and its potential.

Exhaustive Fluorination of Organic Compounds with High Valency Metallic Fluorides has been studied extensively as reported by Stacey and Tatlow. A variety of organic compounds has been fluorinated, especially with cobaltic fluoride and silver difluoride. Other reagents such as manganese trifluoride, cerium tetrafluoride, and lead tetrafluoride have been of more limited interest and utility. Silver difluoride and cobaltic fluoride are most applicable for the synthesis of highly fluorinated compounds and in particular perfluoro compounds, *i.e.*, those in which all carbon–hydrogen bonds have been replaced by carbon–fluorine bonds. Since high temperatures are required, it is not sur-