Chapter 16 is a review of "The Proteins of Blood Coagulation" by E. W. Davie and O. D. Ratnoff. Our knowledge of the complex process of blood coagulation has grown rapidly and is well reviewed by these authors. They discuss fibrin formation in mammalian blood and describe in considerable detail the properties of 13 clotting factors. Current ideas on mechanism of blood coagulation are reviewed, and the role of intrinsic and extrinsic clotting systems is summarized. The known inhibitors of blood coagulation and the properties and function of plasmin and plasminogen are discussed.

The last chapter, Chapter 17, deals with "Interaction of Proteins with Radiation" and was written by G. Weber and F. W. J. Teale. This chapter is a physical–chemical examination of the interaction of protein molecules with radiation that does not result in irreversible change. The authors discuss the infrared absorption spectra of proteins and the ultraviolet absorption spectroscopy of proteins largely from a theoretical point of view. A section on emission spectroscopy is included that deals with fluorescence of amino acids, proteins, and protein conjugates. Finally, the scattering and retardation of both light and X-rays by protein solutions and the optical rotary dispersion and birefringence of protein solutions are discussed.

Volume III maintains the high standards set by the preceding two volumes of this authoritative four-volume treatise. The topics considered in this volume are more restricted than those in the preceding two volumes, and the authors have been able to develop critically their topics in greater detail and to include much more than a mere review of published data. Each chapter has a long list of references to original papers. This volume will be of particular value to those research workers and advanced students of biochemistry, biology, physical chemistry, biophysics, and related fields who want to keep well informed on current progress in protein chemistry and particularly in the proteins of blood or viruses.

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Order-Disorder Phenomena. By H. S. Green and C. A. Hurst, Department of Mathematical Physics, The University of Adelaide, Adelaide, South Australia. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1964. x + 363 pp. 15.5 × 23.5 cm. $15.00.

Within the past several years theoretical research into the mathematical structure and physical implications of models exhibiting critical phenomena has attained a fashionable vigor. Motivation for this increased activity has been twofold: Onsager's brilliant solution of the two-dimensional Ising model a generation ago still retains an awesome beauty in spite of its complicated sophistication, and the surprisingly unorthodox singular behavior of thermodynamic functions at critical points (revealed in part by Onsager, and more recently and completely by the Domb school in England) for both two- and three-dimensional models constitutes a frustrating and exciting challenge to the intuition.

The monograph under review was, according to the preface, solicited by Professor I. Prigogine as Volume 5 in his Monographs in Statistical Physics series, mainly on account of the impressive body of elegant mathematical results that have been accumulated in solving order–disorder problems. In acceding to that request, the authors have succeeded in conforming to the high standards of previous volumes in the series.

The book's major emphasis rests upon the authors' own research into the method of evaluating order–disorder partition functions by means of Pfaffians (triangular arrays of numbers). The method is spelled out in great detail, not only for the standard rectangular, triangular, and hexagonal lattices, but also for lattices with (generally) highly decorated bonds and sites. Although it is probably fair to say that the Pfaffian method in the last analysis cannot cope with any models that are beyond the capability of alternate approaches (the original Onsager method in any of its various guises, or the Kac-Ward combinatorial technique), it does, nevertheless, provide a nicely systematic scheme for handling especially the soluble models with high degrees of decoration complexity. In addition it becomes rather clear in the Pfaffian method which mathematical features prevent solution of the physically interesting models with nonnearest-neighbor potentials, external fields, or dimensionality greater than two.

As an aid to the reader there is a mathematical appendix containing information that is relevant and useful in the preceding text, on determinants, matrices, Pfaffians, and hyperbolic trigonometry.

The unsuspecting potential buyer deserves warning on at least two accounts. The rapid pace of advances in the theory of phase change, compared with the traditional torpor of book publishing schedules, has antiquated some of the procedures contained in this work; in particular, the difficult and lengthy long-range order calculation is superseded by the simpler approach of Schulz, Mattis, and Lieb. In addition, the reigning philosophy clearly is mathematical, rather than physical or chemical. Although there are short sections in the beginning on applications to magnetism, alloys, and liquids, the novice would do well to initiate his training in order–disorder phenomena with some other source, such as Hill's "Statistical Mechanics" (1956). For the serious student of phase-transition theory, who must be willing to follow each of the separate analytic approaches to his field to its furthest limits, this book, however, represents an indispensable contribution.

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The Solvent Extraction of Metal Chelates. By Jiří Starý, D.Sc., Department of Nuclear Chemistry, Faculty of Technical and Nuclear Physics, College of Technology, Prague. Edited, with a foreword by H. Irving, Professor of Inorganic and Structural Chemistry, University of Leeds. The Macmillan Co., 60 Fifth Ave., New York, N. Y. 1964. xiv + 240 pp. 15.5 × 23.5 cm. $8.50.

The "Solvent Extraction" of the title is the currently popular designation of liquid–liquid extraction in which the two phases are aqueous solution and organic solvent.

One-fourth (50 pages) of this monograph is devoted to general aspects of chelate extraction: composition and stability of metal chelates, theory of their extraction, and analytical applications (separations, substoichiometric determinations, extractive titrations). The section that follows deals with individual chelating reagents finding use in analytical extractions. Good use is made of tables to summarize the optimum conditions for extraction. Lastly, one or two concise procedures, considered to be the most selective of those available, are given for each of almost 50 elements. It will be realized that some of these chelate extractions are inferior to extractions of ion-association compounds (which do not fall within the scope of the book). A collection of almost 1100 references is included.

Dr. Starý has been successful in compressing much information into a small volume and providing a book which can be recommended for reference when questions concerning chelate extractions arise.

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The Acyclic Aliphatic Tertiary Amines. By Leonard Spialter, Head, Organic Chemistry Section, Aerospace Research Laboratories, Wright-Patterson Air Force Base, Ohio, and Joseph A. Pappalardo, Associate Professor of Chemistry, University of Dayton, Dayton, Ohio. The Macmillan Co., 60 Fifth Ave., New York, N. Y. 1965. xiii + 512 pp. 16 × 24 cm. $18.00.

In this book the authors have given a remarkably thorough coverage of the acyclic aliphatic tertiary amines, containing carbon, hydrogen, and nitrogen only. The literature survey includes the amines of this type reported in the original literature and indexed in *Chemical Abstracts* through June of 1961. Monoamines and polyamines are included with saturated and/or unsaturated hydrocarbon groups from C_8H_9N to $C_{87}H_{177}N$ for monoamines and from $C_5H_{14}N_2$ to $C_{21}H_{50}N_6$ for polyamines, representing more than 700 compounds.

The following statement given in the preface should be emphasized: "Although *Chemical Abstracts* and Beilstein's 'Handbuch der organischen Chemie' provided excellent initial guidance, it

was found eminently desirable for optimum completeness, cross-referencing, and accuracy to rely on the original work, itself."

The introduction includes four interesting and instructive sections: the scope, the historical background, nomenclature, and the general properties of these amines. Following this there are 80 pages on methods. Essentially all methods that have been used in preparing aliphatic tertiary amines are reviewed. Procedures are discussed critically and the scope and limitations given. If proposed structures or yields reported may be in doubt, this is indicated. Many well-organized tables are given as well as detailed typical examples of the more common procedures.

A considerable portion of the remainder of the book is devoted to data on the individual amines. Each compound is identified by its graphic or "stick formula" showing only nitrogen and carbon atoms. Also given are the molecular formula, a systematic name, methods of preparation, physical properties, and derivatives (when available). All data are referenced to the original citations published in the literature. Very naturally the literature on trimethylamine, triethylamine, and a few others is far more voluminous than for most aliphatic tertiary amines. In view of this importance, several pages are devoted to each of these amines. In fact, trimethylamine has been given a critical treatment occupying 13 pages.

The indexing is satisfactory, including a subject index and a formula index. When several amines are under one molecular formula, the "stick" or skeleton formula readily identifies the one sought. A simple and convenient way of indexing references is used in which the first two letters of an author's name and a number are given.

The book will be indispensable to those engaged in research in any way related to amine chemistry, particularly aliphatic amine chemistry.

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Digital Computer Programs for Physical Chemistry. Volume II. Autoplotter, Expansion, Self-Judgment, Spectral, Polarization, Conductance, Kinetic, and Special Iterative Programs. By PAUL A. D. DE MAINE, Department of Chemistry, University of California at Santa Barbara. The Macmillan Co., 60 Fifth Ave., New York, N. Y. 1965. xxvii + 493 pp. 16 × 24.5 cm. $19.95.

It is difficult to determine for whom this book was written. Certainly no physical chemist with a reasonable amount of computer experience would wade through lengthy sections giving complete printouts of FORTRAN or ALGOL programs designed for handling simple, rather specialized problems in data processing. Nor would an experienced hand be likely to brush aside basic statistical principles and terminology quite so cavalierly as have the authors. On the other hand, the explanations of the programs are not very clear, no flow charts of the programs are given, and no COMMENT cards are included in the programs themselves. Thus, the book is not well adapted for use by the beginner.

Of those people who might be inclined to use this book, many will be put off by its excessively high price.

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Conformational Analysis. By ERNEST L. ELIEL, University of Notre Dame, NORMAN L. ALLINGER, Wayne State University, STEPHEN J. ANGYAL, the University of New South Wales, and GEORGE A. MORRISON, University of Leeds. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1965. xiii + 524 pp. $15.00.

The study of relationships between structure and chemical and physical properties of molecules is the essence of research in organic chemistry. Conformational analysis merely focuses attention upon extension of structural theory to flexible molecules. The Westheimer report (see *Chem. Eng. News*, Nov 29, 1965) states, "the structural theory of organic chemistry, one of the great intellectual achievements of man, was introduced in 1858–1865 by Kekulé and others, and stereochemistry (spatial chemistry) was invented by van't Hoff and Le Bel in 1874." Conformational analysis traces its ancestry to this honored source. In the preface of "Conformational Analysis," the authors credit the recent rapid development of the subject to D. H. R. Barton, and consider the subject such an integral part of current structural theory, "that a chemist who does not understand conformational analysis does not understand organic chemistry."

Students of organic chemistry at every level above the elementary will welcome this excellent book. For the novice, the subject requires a good set of molecular models and a background including the fundamentals of stereochemistry, general organic and physical chemistry (especially thermodynamics), and interpretation of physical properties (*e.g.*, nmr spectra). For the expert, the book provides an excellent selective review with good coverage through 1963 and a few 1964 references in most chapters. This book outclasses a smaller one on the same subject (M. Hanack, "Conformational Theory," Academic Press Inc., New York, N. Y., 1965), a work of considerable merit, designed primarily for use as a course text. Although conformational problems arise wherever there are flexible molecules, it is interesting to note that both books devote about 93% of text to cyclic compounds; six-membered rings receive most attention.

The thirty pages on acyclic molecules (Chapter 1) provide an excellent compact review of conformational concepts. Chapter 2, apparently a revision and expansion of Chapter 8 of Eliel's text, "Stereochemistry of Carbon Compounds" (McGraw-Hill Book Co., Inc., New York, N. Y., 1962), presents a detailed application of conformational principles and conformation–reactivity relationships to cyclohexane derivatives.

An excellent survey of the use of physical methods in structure determination is offered in Chapter 3. Each method is illustrated by a few well-chosen examples from studies of configuration and conformation. Clear, concise, and packed with useful information, Chapter 3 is notable for its appraisal of each method. For example, see the incisive evaluation of the interpretation of Kerr constants (Section 3–8).

Rings of all sizes, including fused and heterocyclic rings, are considered in Chapter 4.

Steroids, triterpenoids, and alkaloids are the topics of Chapter 5. However, Chapters 2, 3, 4, and 7 contain much of importance on these topics. Chapter 5 was not designed to stand alone. Conformation (Section 5–2) and conformational transmission (5–9) are discussed for steroids. Intermediate sections consider problems of configuration and synthesis at length with attention to their stereochemical and conformational aspects. This important chapter contains a wealth of information and many excellent illustrations, but is somewhat deficient in selectivity, clarity, and coverage of post-1962 literature. The other chapters set a very high standard which Chapter 5 does not quite match.

Chapter 6, entitled "Conformational Analysis in Carbohydrate Chemistry," is not just an excellent review, but a beautifully written, significant contribution to the field. The hope that this chapter may stimulate interest in research on the conformation of carbohydrates is well founded.

Tabulation of conformational energies of monosubstituted cyclohexanes, including the literature reference for each experimental value, occupies about ten pages of Chapter 7. Several additional entries for this growing list are now available: E. L. Eliel, *Angew. Chem.*, **77**, 784 (1965). A superb essay on the calculation of conformational energies is included (Section 7-2). Finally, α-halo ketones and boat forms are discussed for cyclohexane derivatives.

As a review of the field, the book serves with distinction. When supplemented with problems, it should prove to have great value as a course text.

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BOOKS RECEIVED, *January 1966*

BERTIL ARONSSON, TORSTEN LUNDSTRÖM, and STIG RUNDQVIST. "Borides, Silicides and Phosphides. A Critical Review of Their Preparation, Properties and Crystal Chemistry." John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1965. 120 pp. $4.25.