The last article by Dr. R. M. Noyes, well known for his explorations of diffusion-controlled reactions, is an attempt to systematize the terminology and techniques for the mathematical treatment of the kinetic equations for consecutive reactions. This will not be an easy article to read for most kineticists, but the treatment and approach can be very useful. In particular Dr. Noyes presents some quantitative thermodynamic criteria in terms of free energies for the use of such familiar approximations as "rate-controlling step" and "uniform flux treatment." This is perhaps more of a new contribution rather than being a review of old work, but this has become a growing trend in such books.

Dr. Porter, the editor, is to be congratulated on putting together a most useful adjunct to the literature of chemical kinetics. It will be must reading for any researchers venturing into the fields covered, and a most useful starting point for graduate students beginning their studies in these areas. It is rather a pity that literature references seldom go beyond Feb. 1962, and this seems surely too long a time lag for this type of book. This is not the most useful way to distinguish this series from annual reviews. It also occurs to this reviewer that many potential readers would be interested in purchasing individual articles. What are the prospects for this happening?

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**Elastic Liquids. An Introductory Vector Treatment of Finite-Strain Polymer Rheology.** By A. S. LODGE, The Manchester College of Science and Technology, England. Academic Press Inc., Ltd., Berkeley Square House, Berkeley Square, London, W1, England. 1964. xii + 389 pp. 16 × 23.5 cm. Price, $12.00.

This carefully prepared and well-documented book will be of interest to polymer chemists, chemical engineers, fluid dynamicists, and applied mathematicians. It will be particularly valuable to those who are doing research in rheology and to those charged with planning and directing laboratories concerned with viscometry and mechanical testing. In addition, it will serve well as a textbook for an introductory course in mechanics of continua.

The introductory chapter gives a brief exposition of those aspects of vector analysis and nonorthogonal coordinates needed for the subsequent chapters. The next two chapters summarize the description of strain and stress, but consider only very simple flow situations (*e.g.*, pure shear, steady shear flow, steady elongational flow), thereby keeping the discussion relatively elementary; no tensor analysis is used in this discussion, and emphasis is placed on straightforward geometrical pictures. In the chapters which follow, the concepts thus developed are used to describe the mechanical phenomena observed in rubberlike solids, Newtonian liquids, and rubberlike liquids; in connection with the latter, considerable space is devoted to elastic recoil phenomena. By this time, the reader is equipped to understand most of the observed rheological phenomena, including normal stresses, the Weissenberg effect, and various types of elastic recovery. These first seven chapters (about 150 pages) constitute a well-organized "short-course" in rheology, which uses only vector analysis, analytic geometry, and ordinary calculus. A reader thus equipped will find much of the rheological literature meaningful to him.

The remaining five chapters are of a more specialized nature and reflect the particular research interests of the author. These chapters will have considerable appeal to various specialized audiences. Chapter 8 deals with the general problem of constructing rheological equations of state. Chapter 9 is probably the best available summary of normal stress experiments and their interpretation. Chapter 10 is a survey of the various unusual properties of concentrated polymer solutions, which are of both scientific and industrial interest. Chapter 11 is a set of complete solutions to the problems at the end of Chapters 1–7. And Chapter 12 is a recapitulation of Chapters 1–7 in the more general language of tensor analysis; this chapter will appeal to those whose mathematical training has included a study of tensor analysis, equivalent to McConnell's book, for example. This final chapter gives formal justification for the elementary approach used previously.

This lucid book is unique in its field. It emphasizes the viewpoints developed by Weissenberg, Oldroyd, and, of course, the author himself. It has excellent balance between theory and experiment, and between mathematics and physics. The book will help bridge the gap between the experimentalist (who may not know what he should be measuring) and the theoretician (who may not be sufficiently concerned with the experimental verification of his theories). The author emphasises the urgent need for various types of data, in particular viscosities of concentrated polymer solutions, elongational viscosity, finite amplitude oscillatory shear, and oscillatory normal stresses. The orderly presentation, careful literature citations, economy of notation, and frequent word-summaries of mathematical results give indication of the author's sympathetic attitude toward the reader as well as his pride in sound scholarship. Typographical errors seem to be few and far between.

This reviewer feels that a few additional items could well have been included to make the book even more useful: somewhat more quantitative information on non-Newtonian viscosity and linear viscoelasticity would give readers a better feeling for orders of magnitudes of some important effects; even the inclusion of some sample constants for empirical models would have been useful. It is unfortunate that no mention was made of the work of Eyring on the molecular theory of non-Newtonian viscosity in about 1935; also the Kuhn–Kramers–Kirkwood–Zimm line of development of molecular theories of linear viscoelasticity deserve mention. Some word of warning should have been given concerning viscous heating as a possible disturbing factor in viscometry. Also, it is unfortunate that the author did not include H. Markovitz's excellent summary of the faults of various rheological models in describing normal stress phenomena (*Trans. Soc. Rheol.*, Vol. 1); as it is, the reader is not left with much of a feeling as to the practical applicability of the various models presented in Chapters 4 through 8. Finally, this reviewer feels that many a beginner will be confused because Chapter 1 does not include an explanation of the idea of covariant and contravariant components; certainly some readers will wonder why the author writes $p_{ij}$ but $\pi^{ij}$.

The author is to be congratulated for his judicious restriction of the scope of the book and his literary craftsmanship. "In der Beschränkung zeigt sich der Meister."

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**Selected Works in Organic Chemstriy.** By A. N. NESMEYANOV, U.S.S.R. Academy of Sciences. The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. xvi + 1172 pp. 18 × 25 cm. Price, $30.00.

In 1959 there was published in Russian four volumes containing all the scientific papers of Professor A. N. Nesmeyanov. Of these, the first three volumes were devoted to Nesmeyanov's experimental findings together with generalizations and theoretical interpretations concerning them. The present volume brings together in English most of the work described in the original three volumes. As such it should prove a highly valuable and useful source of reference for much of his extensive and important studies.

The divisions of the book are headed as: Part I—Organometallic Chemistry (a) Diazo method of synthesis of organometallic compounds; (b) Synthesis of organometallic compounds; (c) Quasi-complex and unsaturated organometallic compounds. Tautomerism and β-conjugation; (d) Sterochemistry of substitution reactions; (e) Ferrocene and metal carbonyls. Part II—Chemistry of Element–Organic Compounds (a) Onium compounds; (b) Organic compounds of Si, Ti, F. Part III—Investigations in Organic Chemistry (a) Synthesis on the basis of β-chlorovinyl ketones; (b) Synthesis of polychlorohydrocarbons and related compounds, and their chemical conversions.

As the divisions indicate, the book is concerned very largely with his numerous and significant studies in the field of organometallic chemistry. All of the papers have appeared in Soviet periodicals, and some of them have also been published in journals such as *Berichte, Tetrahedron, Zeitschrift fuer anorganische allgemeine Chemie*, and *Quarterly Reviews*. It would have been more helpful to most readers to have replaced the *Quarterly Reviews* article by other original papers.

Very unfortunately, there is neither an author nor a subject index. However, the table of contents gives the names of coauthors and the full title of each paper. Also, after the experimental section of each article, there are the literature references which were given in the original paper. In an extensive work of this kind, one would expect, and here finds, some misprints and occasional awkward translation expressions. The book provides a splendid means of acquiring a broad picture of the extensive studies carried out over a period of 30 years by one who has contributed so much to Soviet chemistry and education, and also to organic chemistry generally. It is a compliment to Professor Nesmeyanov that he has carried on such a comprehensive research program in addition to meeting so well the other great demands on his time and energy. In particular, we refer to his directorship of the Institute of Element–Organic Chemistry where he has assembled a highly competent and productive staff to effectively extend organometallic chemistry in varied directions.

The price of the book is such that few individual purchasers can afford it. It should, however, find a useful place in reference libraries.

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**Crystallization of Polymers.** By LEO MANDELKERN, Professor of Chemistry, Florida State University. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York, N. Y. 1964. 359 pp. 16 × 24 cm. Price, $13.50.

In this book the structural requirements for polymer crystallization are analyzed with competence as well as certain aspects of the thermodynamic and kinetic processes associated with fusion. Professor Mandelkern discusses in great detail previous work on the fusion of homopolymers, copolymers, and also cross-linked polymers. In addition, the crystallization of oriented polymers and diluent compositions are described in individual chapters devoted entirely to these systems.

The relatively recent discoveries of stereospecific synthesis and polymer single crystals have completely changed our understanding of crystallization phenomena in polymers. Owing to these exciting developments, a considerable amount of research is currently being conducted to test many new concepts which have immerged. As a result, the chapter on polymer morphology is very incomplete and important structural data have been omitted. In particular, the occurrence of regular chain folding in both single crystals and bulk polymer is not given sufficient emphasis.

Unfortunately, like other recent books in polymer science, the author emphasizes certain areas of crystallization phenomena with which he is most familiar. Subsequently, the entire manuscript development is based on a single point of view. Throughout most of the theoretical treatment, fundamental structural models are used which as a result of recent research have questionable validity.

Nevertheless, "Crystallization of Polymers" is recommended to individuals who are doing work in this field of polymer science. Despite the complexity of the subject matter, the manuscript is well written. There are numerous references at the end of each chapter and also many tables containing valuable data.

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**International Series of Monographs on Analytical Chemistry. Volume 16. Analytical Chemistry of Niobium and Tantalum.** By ROSS W. MOSHIER, Aerospace Research Laboratories, Wright-Patterson Air Force Base, Ohio. The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. v + 278 pp. 16 × 23.5 cm. Price $12.75.

Roughly one-fourth of this reference book is devoted to the general chemical and physical properties of niobium and tantalum and their compounds, and their detection and identification as well as the classical methods of dissolution of materials and the gravimetric determination of the elements after separations. The older classical methods of Schoeller and Powell and others are supplemented by methods based upon the newer complexing agents and the more recently available organic chelating agents.

In the remainder of the treatise, there are separate chapters on separations by solvent extraction, separations by ion exchange and chromatography, and separations by chlorination and distillation.

Detailed coverage is given on colorimetric determinations (four chapters), reduction and titration, polarography, X-ray methods, both diffraction and fluoresence, neutron activation and radioactive tracer methods, spectrographic methods, and the determination of impurities in purified niobium or tantalum, their alloys, etc.

The treatise gives a very broad coverage of the methods. At times the treatment impresses one as rather noncritical and as presenting all likely methods that have been published. A broad basis is provided for the reader and research worker for selection of methods for various purposes.

There are useful Author and Subject Indexes.

Few misprints or typographical errors were noted. On p. 12 niobium is written as "nobium" in the second paragraph.

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**Physical and Chemical Methods of Separation.** By EUGENE W. BERG, Coates Chemical Laboratories, Louisiana State University, Baton Rouge, La. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. 1963. xiv + 366 pp. 15.5 × 23.5 cm. Price, $12.50.

The chemical analyst, the research chemist, and the process developer—be he chemist or chemical engineer—depend heavily in the discharge of their tasks on the ability to separate phases and components of mixtures. The required separations, whether partial or quantitative, must be under the rigid control of one who would exploit them effectively. Chemical engineers are trained specifically in the principles and techniques of separations—physical separations, at least—and are prepared to deal with them in their earliest postbaccalaureate days. Not so chemists emerging from most colleges and universities, at whatever degree level. They will have had a hit-or-miss encounter with separations, according to Professor Berg, who deplores such deficiency in the chemist's academic experience, has set about correcting it at his institution, and has written himself a textbook for his course.

The resulting book is probably unique, and it fairly achieves the author's aim "to present a concise and informative survey of separation techniques." The separations described are fractional distillation, extraction, chromatography (gas–solid, gas–liquid, and paper), electrochromatography, ring-oven concentration, zone melting, ion exchange, ion exclusion, dialysis and electrodialysis, precipitation and related phenomena, froth flotation, and biological methods. Included also is a chapter on sequestration—sometimes a reasonable substitute for separation—by Philip W. West. The chapter on gas–liquid chromatography is by Buddhadev Sen.

The experienced reader will recognize at once that many separation methods are missing. This reviewer constructed a list that contained as many ignored as treated by the author. Admittedly half of these were mechanical phase separations, whereas Berg has tacitly but almost completely confined his attention to component separations; admittedly also many were less important than most of Berg's. No doubt an author who intends not to produce an encyclopedic work, like Weissberger's "Techniques of Organic Chemistry," must draw an arbitrary line somewhere. Yet one wishes that this book might contain chapters or sections on gas absorption and desorption, selective dissolving, perhaps electrolysis, and such enormously valuable but often subtle mechanical separations as sedimentation, filtration, and precipitate washing.

By and large, the subjects included are presented adequately if sometimes inelegantly. The weakest treatments are so because of their portions on theory (*e.g.*, Chapter 5, "Gas Chromatography"). Too often there are derivations that give the impression of being pointlessly long and uncomfortably unauthoritative. For a book of this magnitude, a better practice might be to offer whatever theory-based relationships are useful with only reference to published sources of the supporting derivations. On the other hand, the inclusion in each chapter of sections on applications and restrictions, the detailed documentation of the text, and the presentation of extensive bibliographies are features of excellent strength. And the collection between