

much material of interest to all but the analyst who never intends to modify a commercial instrument. For him the chapter on analysis will hold the greatest interest. Not only does it review all the important analytical techniques, but also gives sufficient information about the different commercial instruments to help him select one best suited for his requirements.

Two very comprehensive and authoritative reviews on isotope and free-radical mass spectrometry are presented by the heads of the outstanding groups in these areas. Both are highly readable. The final two chapters are concerned with research applications in chemical physics. One describes the measurement and interpretation of appearance potential measurements using electron and photon impact sources, as well as discussing other primary ionization processes. The other is a very well-written, if somewhat too brief a treatment of the increasingly important field of ion-molecule reactions. One would have liked to see included in this chapter a discussion of the equally important, related processes, such as charge transfer, atom-ion interchange, etc.

The book is relatively free of mistakes and typographical errors with one notable exception. The Editor's own chapter is replete with both, the most serious of which is a misstatement of Stevenson's rule. Presumably he was too busy editing the other chapters to be concerned with his own. The other chapters do, however, present us with some rather horrendous additions to the technical vocabulary such as *reflamented*, *monochromatize*, and *deboltzmanisation*. But the prize must surely be awarded for *non-endorgeticness*.

In his introduction, the Editor admits that the advantages gained by the use of many authors may be offset by a lack of uniformity in style and outlook. Confession does not, however, bring automatic absolution. This nonuniformity, coupled with a considerable amount of redundancy, and some serious omissions are the main faults of the book despite the excellence of many of the individual contributions. Thus, for example, photoionization is described in several chapters, and we really do get to know that J. J. Thomson, Aston, and Dempster had something to do with early mass spectrometers. Some notable omissions are: the use of mass spectrometers in (1) plasma research, (2) upper atmosphere composition studies, (3) crossed beams and other important atom physics research such as those being conducted at University College and the University of Pittsburgh.

In spite of these short-comings, it is undoubtedly the most authoritative and comprehensive single volume on mass spectrometry and will find its place on the bookshelf of anyone involved with any aspect of this complex field.

DEPARTMENT OF CHEMISTRY
MCGILL UNIVERSITY
MONTREAL, CANADA

H. I. SCHIFF

Macromolecular Synthesis. A Periodic Publication of Methods for the Preparation of Macromolecules. Volume I. Edited by C. G. OVERBERGER. John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. ix + 81 pp. 15 × 23.5 cm. Price, \$4.75.

"Macromolecular Syntheses" is a projected series of publications on detailed laboratory methods for the preparation of polymers. The title recalls the extremely useful series, "Organic Syntheses," and, indeed, the format of the new work is that of the latter. Each preparation consists of Procedure, Notes, Methods of Preparation, and References; the category of Characterization has been added in some, but not all, of the examples. In those where the latter does not appear, however, some of the expected information generally does. For example, a solution viscosity number, molecular weight-viscosity equation, polymer melt temperature, crystalline melting point, glass temperature, density, X-ray diffraction spacings, fiber repeat distance, infrared absorptions, elemental analyses, and mechanical properties (in one instance) appear, although coverage is quite varied, even for equally well-known polymers. In the preparation of crystalline polystyrene, for example, the only characterization given is for "m.p."; no indication of molecular weight is given, and the only notice taken of the crystalline nature of the product appears in the title heading. On the other hand, syndio- and isotactic poly(isopropyl acrylates) are prepared and characterized in considerable detail as to viscosity-molecular weight relationships, infrared maxima, and X-ray diffraction *d*-spacings, along with other helpful information on, and references

to, properties. While the latter polymers represent exceptionally well-characterized examples, the average polymer in the book, to its credit, is better characterized than the first mentioned.

Directions for the preparation of nineteen polymers are given. For some of them, more than one polymerization scheme is given, e.g., free-radical bulk and cationic solution methods for atactic polystyrene. In addition to the polymers already noted, the contents include: bisphenol-A polycarbonate, poly(hexamethylenesebacamide) by interfacial polycondensation, poly(ethylene terephthalate), poly(methyl methacrylate) suspension polymer, poly(acrylic anhydride), ethylene-maleic anhydride copolymer, poly(propylene maleate phthalate), polydisulfide of 1,9-nonanedithiol by catalytic air oxidation, crystalline poly(vinyl chloride) prepared in an aldehyde medium, stereoregular poly(vinyl trifluoroacetate) and poly(vinyl alcohol), poly(π -hexyl 1-nylon), poly(2,5-dimethyl-2,4-hexadiene), poly(1,4-butylene hexamethylene carbamate), poly[ethylene methylene bis(4-phenyl carbamate)], and poly(2,6-dimethyl-1,4-phenylene ether). In keeping with the "Organic Syntheses" style, each preparation has been checked in another laboratory from that of the submitters. The extent of detail provided for execution of each polymerization appears very satisfactory.

It is difficult to fault what will be a multivolume series for the examples selected for appearance in the first volume. In fact, selections in this volume are representative of a sufficient number of polymer types and polymerization reactions to make it quite a valuable source in itself. It is intended that polymers of all types will be included in future volumes, including those of biochemical interest.

The objectives of the editorial board are to provide trustworthy examples for organic laboratory courses and specific assistance for industrial laboratories without polymer experience in a given area. This series should be as successful in serving neophyte and experienced organic polymer chemists as the "Organic Syntheses" series is for organic chemists in general. Many of the latter will use the new polymer series and feel entirely at home in doing so. In this respect, "Macromolecular Syntheses" is another successful and significant effort to put organic polymer chemistry in its correct perspective as a logical segment of synthetic organic chemistry. Volume I of the new series can be highly recommended to anyone working in the organic polymer field or wishing to try his hand there. In all probability, "Mac Syn" will become a standard reference to as many chemists and students as has "Org Syn" over the years.

RESEARCH AND DEVELOPMENT DEPARTMENT
CONTINENTAL OIL COMPANY
PONCA CITY, OKLAHOMA
WAYNE R. SORENSON

Foundations of Thermodynamics. By PETER FONG, Professor of Physics, Utica College, Syracuse University. Oxford University Press, 417 Fifth Ave., New York 16, N. Y. 1963. x + 94 pp. 14.5 × 22 cm. Price, \$2.50.

The purpose of this book is to present the author's original development of the logical structure of equilibrium thermodynamics. The book begins with a very short chapter on the zeroth law of thermodynamics, followed by a hasty discussion of the first law. The treatment of these two laws is conventional. The *raison d'être* for the book is the third chapter, which deals with the second law and represents approximately half of the book. The book ends with short chapters on applications and on the microscopic interpretation of the zeroth, first, and second laws.

In the third chapter the author rejects both the Clausius-Kelvin and the Carathéodory approaches to the second law and instead introduces his own development. He first considers a quantity ϕ , called the *potential of spontaneous transition*, which is a function of the thermodynamic variables (e.g., pressures and volumes) for a composite system made up of two (or more) equilibrium systems with different temperatures, pressures, and compositions. This potential ϕ always increases as the composite system attains equilibrium, i.e., as the substituent systems become uniform in temperature, pressure, and composition by means of heat exchange, volume change, and diffusion across boundaries. The author then determines how ϕ changes in various experimental situations and ultimately shows that ϕ possesses all the properties that are associated with the entropy in the conventional formulation of the second law.

Although this approach to the second law is carefully thought