NEW BOOKS

ADVANCES IN PETROLEUM CHEMISTRY AND REFINING, Volume VI, edited by J. J. McKetta, Jr. (Interscience Publishers, Division of John Wiley & Sons, New York and London, xvi + 550 pp., 1962, $21.00). This volume is the latest in a series which the founders, Kenneth A. Kobe and John J. McKetta, Jr., have issued at approximately annual intervals since 1958. Like its predecessors, it comprises a series of authoritative progress reports covering both scientific and engineering developments in "the most dynamic industry of the twentieth century . . . the petroleum and petrochemicals industry."

The *Advances* series embraces five main subject areas: Economic and Future Trends; Unit Operations and Design; Refining Processes; Petrochemicals; and Mechanical Equipment. The present volume includes an article on Road Octanes versus Laboratory Octanes, in the first category; two on Membrane Permeation and Clathrates and Clathrate Separations, in the second; two discussions of refining processes—Thermal Cracking, Visbreaking and Thermal Reforming and Modern Grease Technology; articles on Carbon-Silicon Compounds and Recovery of Sulfur from Sour Natural and Refinery Gases, in the petrochemical area; and an article on Centrifugal Compressors, in the fifth category. A detailed volume index and a cumulative index for the six volumes (in which the articles are listed alphabetically by title) complete the contents.

As in the case of previous volumes of this series, the selection of subjects is for the most part of timely interest and the selection of authors excellent. It is perhaps inevitable that in a work of this design, with its heterogeneous grouping of subjects, few readers will find all the topics uniformly interesting. Yet even the most specialized subjects (for example those on octane numbers and on centrifugal compressors) contain such a blend of theory with practical considerations that nearly everyone engaged in the technical aspects of the petroleum industry will find elements of interest.

Chemists and chemical engineers working primarily in the glyceride field should find the chapters on Membrane Permeation, Clathrates, Grease Technology, Cracking, and Carbon-Silicon Compounds of special value, either because their field and that of the petroleum technologist overlap in these areas, or because techniques described with reference to the petroleum and petrochemical industries will suggest applications in glyceride oil technology. In some cases (for example, esterification with water-permeable membranes) the subject is of direct interest.

There is considerable variation between the several chapters of this volume in the depth of coverage which the authors have given to their respective subjects. It is clear that the *Advances* are not intended to be comprehensive reviews, but are designed to provide a general understanding and working knowledge of the areas covered, and to afford a good point of departure for the reader who wishes to undertake a more thorough exploration of any of the subjects. It is therefore to be regretted that editorial policy does not require a more uniform depth of coverage, both of text and of bibliography. In the present volume, for example, the excellent chapter of Recovery of Sulfur covers 133 pages of text and contains 632 references; the large subject of Carbon-Silicon Compounds is covered in 22 pages, with 49 references; and the otherwise excellent paper on Centrifugal Compressors provides no bibliography.

On the other hand, the authors and editors have made a commendable effort to supplement information provided in earlier contributions, while avoiding duplication. There is nearly a two-year time-lag between the most recent references and the publication of a volume of *Advances;* and it is therefore to be expected that, in the case of the rapidly developing fields covered by many of the chapters, the most recently published information is absent. Contributions on subjects related to previously covered topics provide an opportunity to fill such gaps. This has been done in the chapter on Clathrates, which briefly updates the more extensive coverage of Molecular Sieves in Volume IV of the series. The chapter on Thermal Cracking, on the other hand, carefully limits itself to non-coking conversions, thereby avoiding duplication of the coking operations discussed in Volume II.

Despite the shortcomings mentioned, the volume is recommended as a valuable addition to the literature designed to keep chemists and chemical engineers abreast of developments in their own fields and to provide an interdisciplinary exchange of information.

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DÜNSCHICT CHROMATOGRAPHIE EIN LABORATORIUM-HANDBUCH, edited by Egon Stahl, with contributions by H. H. Bolliger, M. Brenner, H. Gänshirt, H. K. Mangold, H. Seiler, E. Stahl, D. Waldi, A. Neiderwieser, G. Pataki, U. Kaltenbach, R. Weber, H. Jork and P. J. Schorn (Springer-Verlag, Berlin, Göttingen; Heidelberg, 1962, 534 pp., 56 D.M.).

This book is printed on excellent paper stock and is of the usual good physical quality of books put out by this publisher.

It is divided into two parts: general and special. In the former, which is 137 pages in length, the editor presents his equivocal interpretation of the origin of the present method of thin-layer chromatography. The general part includes the method of preparation of adsorbent-coated plates on Stahl designed equipment and ignores description of other available commercial equipment which is more reasonable in price. Mere mention is made that other equipment designs have been described in the literature and these are dismissed with the statement that they produce less uniform layers.

There are a number of simple methods of preparing coated plates without recourse to the expensive commercial equipment but these are ignored completely in the text.

There are chapters on the theoretical basis for thin-layer chromatography (TLC), quantitative work, isotope techniques and documentation.

The second part is divided into the various fields in which TLC has been used. These include lipids, terpenes, vitamins, steroids, organic bases, drugs, clinical and pharmacological work, synthetic organics, hydrophilic plant substances, amino acids and derivatives, nucleic acids and nucleotides, sugers and sugar derivatives, and inorganic ions. A section by D. Waldi lists 157 spraying agents for making various compounds visible on the chromatograms.

The book is well documented and although incomplete brings together in one place a great deal of information on a rapidly expanding technique. It is at present the largest reference work on this subject.

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ADVANCES IN SPECTROSCOPY, Vol. II, edited by H. W. Thompson (Interscience Publishers Inc., 483 pp., 1961, $13). This second volume continues the same high calibre reviews of topics in spectroscopy as the first volume (reviewed in *JAOCS, 38,* 24, 1961) and much the same comments are in order. The reviews are well done and achieve the purpose of providing authoritative surveys of recent progress. This book should be in every spectroscopy library.

Nine topics have been reviewed in this volume: Emission and absorption of flames are reviewed in two chapters by A. Walsh, Application of Atomic Absorption Spectra to Chemical Analysis, (pp. 1–22) and A. G. Gaydon, Spectra of Flames, (pp. 23–56). Atomic absorption spectroscopy is discussed with a realistic appraisal of the applications and of the difficulties encountered with the technique. Various aspects of the emission and absorption of flames are discussed in the second review.

The review of X-ray Spectroscopy is written by Herbert Friedman (pp. 57–100). The rapid growth of X-ray emission (fluorescence) methods makes this review par-

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ticularly pertinent. As is perhaps fitting, the review is oriented toward description of the available equipment rather than toward applications, although one feels that much more needs to be written on this subject. The use of alpha particle excitation of X-rays appears to have considerable potential and it is surprising that more has not been done along this line. R. E. Richards discusses Nuclear Magnetic Resonance (pp. 101–188) in an excellent article which takes the form of a descriptive treatment of the various effects that can be observed. The author achieves his aim of presenting a "balanced account of uses and potentialities to problems in chemistry and chemical physics." This section is recommended as an introduction to the theoretical treatment of NMR spectra.

The review of Infrared Spectra of Crystals by W. Vedder and D. F. Hornig (pp. 189–262) is limited to a discussion of the spectral effects related to the intramolecular forces in crystals which are useful in elucidating the nature of the crystalline state. In this respect it is good, but falls somewhat short of filling the needs of the applied spectroscopist. A most interesting discussion of the Refraction of Gasses in the Infrared is given by J. H. Jaffe (pp. 263–292). It is pointed out that refractive dispersion curve and absorption curve in the infrared are merely different aspects of the same phenomena and that theoretically, one can calculate one from the other. This discussion is particularly important to the practicing spectroscopist because of the recent introduction of the ATR (Attenuated Total Reflectance) technique and the relation of the ATR spectrum to the absorption spectrum of a material.

Biological applications are discussed in two articles, The Ultraviolet Absorption Spectra of Proteins and Related Compounds, by G. H. Beaven (pp. 331–428), and Infrared Spectra of Micro-organisms by K. P. Norris (pp. 293–330). In both of these reviews, one gets the impression that much has been done with very litte. The situation with micro-organisms looks more promising in that spectra of micro-organism fractions appear to be useful in classification and in studies of life processes. The final review is, Some Recent Developments in the Theory of Molecular Energy Levels, by H. C. Longuet-Higgins (pp. 429–472). This is a mathematical treatment.

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Gas Chromatography, by Howard Purnell (John Wiley & Sons, 441 pp., 1962, $12.00), is ordered into three main sections, The Physico-Chemical Background of Gas Chromatography, Chromatographic Theory, and Gas Chromatographic Practice. The physical background section develops the mathematics of solution, adsorption, partition, vaporization of liquids, gaseous diffusion and gas flow. The chromatographic theory section proceeds from the first section to develop the theoretical plate concept, rate theories, and the thermodynamics of gas chromatography. Section three describes equipment design and utilization with examples of analyses.

It is a valuable addition to the literature concerned with this analytical tool. By developing a description of the technique from the applicable physical background, this book provides a consolidated basis for understanding the reasons for a choice of instrument conditions to perform specific analyses. The author diverges from the usual procedure of introducing gas chromatography in terms of the instrumentation and the analyses which have been performed. Instead, a basis for evaluation of instrument performance in terms of separation quality and detection sensitivity is presented before the description of application.

This book is recommended to the investigator who uses gas chromatography as an analytical tool and whose background excluded the mathematics to develop for himself the use of chromatographic theory. It is also recommended to the investigator who uses chromatographic theory for its own sake or for a basis of analytical method development. For this investigator, the book would serve as a consolidated reference. The logical development of this book is well executed and is reminiscent of a well-written, descriptive mathematics text.

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Wood Chemistry. Proceedings of the Wood Chemistry Symposium held in Montreal, Canada, August 9–11, 1961. (Butterworth Inc., 254 pp., 1962, $9.00). This book contains the text of papers presented at a symposium sponsored by the Applied Chemistry Section, Pulp, Paper and Board Division of the International Union of Pure and Applied Chemistry. The fifteen papers have appeared previously in Pure and Applied Chemistry, Vol. 5, Nos. 1 and 2.

For the specialist in wood chemistry this book serves as a reference volume of convenient size and as a review of the more recent work by some of the leaders in this field. For the non-specialist there is enough background and explanation presented in the introduction of most of the chapters to make them easily understood. The book is not indexed, nor does it include any discussion.

The subject matter is confined almost exclusively to lignin, cellulose, and hemicellulose with no coverage of bark, or the extractives or lipid components of the tree. There are discussions of the structure and biogenesis of both lignin and carbohydrates. The work on lignin is an interesting example of how the structural features of a natural polymer have been largely learned by studying a polymerization *in vitro* and comparing the properties of the synthetic intermediates and the natural material. Anyone working with carbohydrates will find something of interest in the discussions on methods of isolating and purifying hemicellulose and on the applications of infrared and X-ray techniques to structure determinations. Other topics include chemical grafting on cellulose, pulping and bleaching mechanisms, the physical chemistry of lignin, and viscoelastic behavior of cellulose.

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Chromatographic Analysis, Discussions of the Faraday Society, No. 7, 1949 (Butterworths, London, pp. 336, 1963 ($12.00). This "Discussion of the Faraday Society," which was published in 1949, has long been out of print. Many requests and inquiries were received by the Faraday Society concerning the publication so that it has now been reprinted and published. Many of the papers have become classics in the field.

The first five papers in the first section (Physico-chemical Principles and Their Utilization) as well as the next twelve are followed by general discussions. The two subsections (Inorganic and Organic and Biochemical) of the second section (Applications) are also followed by general discussions. In all there are 42 papers in the publication.

Those papers in the first section are of general interest, involving as they do questions of theory. Among the papers in the second section on applications many of the papers are primarily of historical interest although, for the novice in the field of chromatography, these papers will give many helpful hints.

This volume is recommended as a good reference text for the serious student of chromatography be he novice or veteran.

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Optics of Flames, Including Methods for the Study of Refractive Index Fields in Combustion and Aerodynamics, by F. J. Weinberg (Butterworth & Co., Washing-

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ton, D. C., 1963, pp. 251 + x, $10.95). This monogram is an attempt to cover rather exhaustively the usefulness of a wide variety of individual optical methods, their theory, their modification for, and their applications to, combustion research. The text may be considered to consist of two parts, The first three chapters comprise part one:

Chapter 1, containing the minimum necessary optics background, and entitled "Elements of Optics," is a rather unorthodox review in which "Nothing that is not required and used subsequently is included." The chapter consists of a mixture of rather elementary review with development of unusual extrapolations designed around the future requirements of the monogram. In any flame, changes in temperature, in composition, and in pressure accompanying expansion of the gas, give rise to variations in the refractive index. The optical properties of flames and of methods that exploit them all depend ultimately, on changes in refractive index that occur in gases during combustion.

Chapter 2, "Refractive Indices of Gases," is a summary of the dependence of gaseous refractive indices on these variables and of their relative importance in combustion.

"Flame Processes and Their Optical Properties" are reviewed in Chapter 3 to provide the necessary combustion background. Flames of premixed reactants, where a homogeneous mixture sustains the process in a given initial state of composition, temperature and pressure, are discussed both as steady-state flame propagation and nonsteady states. This is followed by a discussion of flame in reactants initially separate, so-called diffusion flames.

The second part of the monogram consists of Chapters 4, 5, 6, and 8, which deal with the general theory, optical techniques and applications to combustion of the individual methods. Under these three general headings "Schlieren Methods" are discussed in Chapter 4, "The Shadow Method" in Chapter 5, and "Deflection Mapping" in Chapter 6. Chapter 7 is an interesting very short interlude, entitled "Distortion of Flame Luminosity," describing the optical "illusions" induced by refractive index fields of the flames when they are observed by their own light. The last chapter, Chapter 8, returns to a consideration of individual methods, with a detailed discussion of "Interferometry," interferometers, interpretation of interferograms, and a comparison of these methods with ray deflection techniques.

A short appendix contains some thirty general references on high speed photography and short-duration light sources and lists 199 specific references cited in the text. A subject index is also included.

The fatty-acid chemist who is interested in the investigation of combustion effects by means of optical methods will find this monogram of considerable value. Most of the material collected here is available only in original publications widely scattered through journals on optics, combustion, physical chemistry, photography, etc. Much of the work is described as original, based on a course of postgraduate lectures given by the author at the Imperial College of Science and Technology in London.

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DESIGN OF EQUILIBRIUM STAGE PROCESSES, by Buford D. Smith (McGraw-Hill Book Co., Inc., 1963, 647 pp. $17.50). This book is of usual appearance and size. The table of contents indicates it covers such subjects as distribution coefficients, design variables, flash separations, binary distillation, ternary extraction diagrams, multicomponent separations, and tray hydraulics and efficiencies. It describes how equilibrium stage processing has to do with liquid-liquid extraction, distillation, and gas absorption and stripping. It indicates that the designer of these kinds of units must be concerned with three major factors. First, he must be concerned with physical chemistry of the materials involved so that the compositions of the various gas and liquid phases can be evaluated at equilibrium conditions. Secondly, there must be a method available to calculate the number of theoretical plates or equilibrium stages required to give a stated separation of the components. In addition, there must be a way of arriving at some value of plate or stage efficiency so that a plant unit can be compared to a theoretical equilibrium unit.

The first two chapters deal with equilibrium relationships. The mathematics and theory of these relationships are covered. References and evaluation of some of the available data, methods, and correlations are discussed. Both ideal and non-ideal systems are covered.

The numerous variables which a design engineer will encounter in a practical industrial plant are described and illustrated. These are related to computer techniques or terminology which have been applied in recent years.

The author gives many methods which have been proposed or used to determine the number of theoretical plates or equilibrium stages required. Some of these are graphical. Some are so called "short cut" methods where estimates may be obtained when complete data are not available. Others are of a theoretical nature and, with the use of computers, will give rigorous results. The author compares the usefulness and adequacy of many of these.

William L. Bolles and James R. Fair, Monsanto Chemical Co., have each contributed a chapter on tray hydraulics, the former on bubble-cap trays and the latter on perforated trays. Tray hydraulics are involved in plate efficiencies, and the final chapter of the book covers this aspect.

This book can be of value to the practicing engineer as well as to a student as a text or reference work. It is a review-type book with much of the material having been covered in earlier texts or journals. A chemical engineer would already be familiar with a considerable portion of the book such as the McCabe-Thiele or Ponchon Method for binary mixtures. However, for a non-chemical engineer, it might be worthwhile. One valuable feature is that many of the various methods are compared. Another is that many references are included so that original articles may be consulted.

From a utility point of view, it would have been desirable to use chapter sub-headings as the page headings. For example, there are six chapters with identical titles covering over 200 pages. The user is interested in finding information on the sub-headings.

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PROGRESS IN POLAROGRAPHY, VOLUME I. Edited by Petr Zuman, with collaboration of I. M. Kolthoff. (Interscience Publishers, 1962; 355 pp., $12.00). When American polarographers see the name Kolthoff on a new book about polarography, they expect an authoritative and reliable work. To see also the names of Delahay, von Stackelberg, Wawzonek, and Vlcek, to mention just a few others, is to hope for something of a scientific feast. The reader of this book will not be disappointed, and the mention of a few authors above should in no way detract from the excellent contributions of the others. Altogether this collection includes articles by twenty expert workers in polarography, among them nine members of the two institutes in Prague that have so skillfully carried on the work of Heyrovsky. The two volumes of this set are dedicated to Professor Heyrovsky on the occasion of his seventieth birthday.

The book is in no sense an elementary text, but rather a series of articles emphasizing advances of the last ten

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years in theoretical and applied polarography. Volume II which follows, is more fully directed to applications than is Volume I. Each of the articles is written by an expert on the subject. Despite the multiple authorship, editing of the book has produced a smoothly flowing exposition without sharp breaks in style from chapter to chapter. Where the literary ability of the author is unusually high, as in the masterly chapter on Concentration Polarization and the Study of Electrode Reaction Kinetics, by J. E. B. Randles, or the delightful Recent Advances in Inorganic Polarography, by G. F. Reynolds, editing has not suppressed good writing.

A fine review, Polarographic Literature, by Marie Heyrovská, begins the book. The second chapter, on the diffusion current equation, by Jaroslav Koutecky and Mark von Stackelberg, is a thorough and scholarly theoretical treatment; it is one of two chapters in German. Chapter 3 is The Instantaneous Currents (i-t Curves) on Single Drops, by Jaroslav Kuta and Ivan Smoler. This article effectively discusses single-drop phenomena with respect to both theory and manifestations on typical i-t curves. Paul Delahay has contributed Chapter 4, Double-Layer Structure and Polarographic Theory, in his usual lucid manner. Adsorption in Polarography, by Charles N. Reilley and Werner Stumm, will be of particular interest to many readers of this journal, since it deals largely with the effects of surface-active agents in polarography.

Chapter 6, by Randles, has been mentioned. Chapter 7 is General Theoretical Treatment of the Polarographic Kinetic Currents, by Rudolf Brdicka, Vladimír Hanus, and Jaroslav Koutecky. The general concept of mass transfer in electrode processes is here carefully worked into quantitative descriptions of polarographic currents in certain particular cases. In this chapter the reader becomes deeply immersed in mathematics. Taitiro Fujinaga, in Chapter 8, Constant-Current Polarography and Chronopotentiometry at the Dropping Mercury Electrode, gives the view of one of the orginators of this interesting and sometimes controversial technique. Chapter 9, The Electroreduction of Anions, by Alexander N. Frumkin and Nina Nikolaeva-Fedorovich, represents some of the postwar work done in the U.S.S.R. Here, as in other chapters, the authors enter into the spirit of the collection by pointing out how fruitful have been many of the fields first plowed by Professor Heyrovsky.

Chapter 10, by Reynolds, as noted above, touches many of the more exciting areas of inorganic polarography in a readable descriptive style. It is followed by Mechanism of the Electrode Processes and Structure of Inorganic Complexes, by Antonin A. Vlcek. Both the progress and the continuing difficulties in deducing structures from polarographic behavior are brought out here. Chapter 12 is Polarography of Complex Compounds, by Jirí Koryta; this article treats the determination of stability constants and the kinetics of total electrode processes. Chapter 13, Trends in Organic Polarography, by Petr Zuman and Stanley Wawzonek, is a short, lively review of recent topics. Petr Zuman gives a further discussion of organic groups, this time more structurally oriented, in Current Trends in the Study of the Influence of Structure on the Polarographic Behavior of Organic Substances. The book ends with the second German chapter, on polarography in non-aqueous solutions, by Kurt Schwabe. Some mixed systems of very low water content are shown to behave surprisingly like aqueous solutions.

References are appended to each chapter. I found a few typographical slips, but nothing distressing. One kind of lapse I noticed twice: trade-marked names were used generically with no identification as trade marks. The publisher's editorial staff should see to such matters. The book has the convenient size of, for example, Inorganic Syntheses – slightly larger than 6 x 9 in. An attractive green and white jacket covers a pleasing hard cover of subdued green. Graphs and reproductions of polarograms are sharp and clear. Typography and makeup are excellent.

For a textbook or reference source on polarography one of the standard works would be preferred. For English-speaking chemists these include the books by Meites, by Milner, or by Kolthoff and Lingane. For those already knowledgeable in polarography who wish to have at hand a reasonably up-to-date collection describing most of the important active areas, *Progress in Polarography* is heartily recommended. Issuance of such collections at intervals of ten years or so would be an admirable service to chemists.

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Progress in Polarography, Vol. II. Edited by Petr Zuman in collaboration with I. M. Kolthoff. (John Wiley and Sons, Inc., Interscience Div., 440 Park Avenue South, New York 16, N. Y. 1962, 450 pages, $15.) This book is the second of two volumes and contains a collection of twenty-three papers, each of which constitutes a chapter in the book. The papers were written by specialists in the field of polarography and electrochemistry in celebration of Nobel Laureate Professor Heyvrosky's seventieth birthday.

The fifteen chapters of the first volume had discussed the advances in the theory of polarography. The chapters in the second volume are primarily descriptive in nature and present the development in the methodology and practices of polarography, in particular, the advances during the past ten years. There is very little consistency in the level or specificity of the material, however, because of the number of contributors and topics. Several of the chapters are too brief and consequently present no more than just a cursory summary of the topic discussed.

The important factors to consider in the collection and measurement of polarographic parameters such as half-wave potentials, wave heights, degree of "reversibility," and capillary constants are treated by Zuman in Chapter 29. The different operational techniques used in measurement of these parameters in classical polarography are also compared and discussed in this chapter.

A brief coverage of theory followed by a discussion of the practical aspects associated with the application of square wave and pulse, single sweep, oxcillographic, and alternating current polarography is found in chapters 19, 20, 21, and 22 respectively. These chapters should serve as an excellent review for those who are unacquainted with these methodologies.

A good survey on the uses, limitations, and properties of other mercury type electrodes, besides the dropping mercury electrode, such as the rotating mercury drop, the streaming mercury, the mercury pool, and the hanging mercury drop electrodes are found in Chapters 16 and 17. A chapter (23) on solid electrodes has also been included.

Polarographic instrumentation is presented in Chapters 24 (United States), 25 (Japan), and 26 (Europe). Chapter 27 has an excellent summary of cell designs and configurations. Since polarographic instrumentation is quite similar irrespective of geographic locations, some of the material presented in chapters 24–27 is redundant in content and scope.

Chapters 18, 28 and 30 through 38 review the application of polarography to the analysis of compounds or elements found in particular fields (medicine, biochemistry, metallurgy, geology, pharmaceuticals, chemical industry), specialties (chromatopolarography), or chemical systems (pesticides, organic reagents, etc.). The long bibliographies

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associated with some of these chapters will be of interest to the analytical polarographer. The reviews in these latter chapters were not meant to be comprehensive, and with this limitation in mind, the summary or tabulation of compounds analyzable by polarography should be worthwhile additions to the analyst's file.

The book appears to be devoid of any major error. It should serve as a reference book for those who wish to review the many practical aspects in the more recent developments of polarography.

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ADVANCES IN ENZYMOLOGY, Vol. 24, edited by F. F. Nord (John Wiley & Sons, Inc., N. Y., 572 pp., 1962, $16.00). The dark recesses of the mechanisms of enzyme action are slowly becoming illuminated. The approaches to this glimmer of understanding have necessarily been varied, as exemplified by the nine articles in this volume.

In accord with, and building upon, the simplicity of the Watson & Crick genetic code model, there appears to be a regular distribution, or periodicity, of certain amino acids throughout the length of a protein chain, as pointed out by Professor Sorm in his article on Identical and Analogous Peptide Structures in Proteins. This periodicity carries over of course to the active site of an enzyme and aids in explaining the organic mechanism by which enzymes function. Chapters on Chemical Modifications of Proteins, Effect of Ionizing Radiation on Enzymes, Molecular Properties of Glycogen Phosphorylose, and The Metabolism of Spermatozoa all emphasize the molecular concept (i.e., the chemical mechanisms) of modern biochemistry. All of these plus some high powered physical chemistry are beautifully coalesced by Professors Scheraga and Rupley in their article on the Structure and Function of Ribonuclease. For those who wish to know how an enzyme is isolated, characterized, modified, and then has its structure correlated with its function, I particularly commend this article.

Professor Westheimer then presents a thoroughly stimulating article on Mechanisms Related to Enzyme Catalysis in which he poses several rather difficult thermodynamic questions. For example, the magnitude of the catalysis by ribonuclease of the hydrolysis of ribonucleic acid is estimated to be of the order of 10^9 or 10^{10}. This enormous rate factor by which the enzyme speeds up the reaction requires an explanation, yet satisfactory answers are not as yet available. Professor Westheimer further states that, "one of the functions of an enzyme is to serve as an entropy trap; that is, an enzyme can overcome the unfavorable entropy of activation usually inherent in a chemical reaction." This of course begs the question—how, chemically, is this accomplished? Theories are offered but they are like viewing that famous painting, "White Cow in a Snowstorm."

Finally, a useful chapter entitled Distribution of Enzymes Between Subcellular Fractions in Animal Tissue is presented which should prove to be of value as a reference tool.

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STANDARD METHODS OF CHEMICAL ANALYSIS, VOL. II A AND II B, Industrial and Natural Products and Noninstrumental Methods, edited by F. J. Welcher, (D. Van Nostrand, xi + 2609 pages, 1963, $50). This book is the second in a series of three volumes on practical methods of chemical analysis. Volume I covers the elements, Volume II (under review) deals with the analysis of various materials, largely by noninstrumental methods, and Volume III (to be published) will handle instrumental methods.

Volume II consists of two parts. The first part (530

pages) contains 21 chapters on apparatus, operations, and reagents. Topics are laboratory apparatus, sampling, detection (qualitative), mechanical separation, separation by precipitation, separation by electrolysis, solvent extraction, separation by distillation and evaporation, chromatography, ion exchange, gravimetric precipitates, titrations, non-aqueous titrations, colorimetric and electrometric determination of pH, statistics, the microscope, quantitative microchemistry, quantitative organic analysis, solubility measurement, and water determination. With a few exceptions, the chapters in this section seem to be of a general or survey nature, being valuable for introduction to the topics dealt with.

The second part (24 chapters, 2007 pages) gives practical techniques for the analysis of various materials, including commercial acids and bases, air pollutants, iron and steel, ferrous and non-ferrous alloys, protein hydrolyzates (for amino acids), bituminous substances, coal and coke, cement, clinical samples, explosives and propellants, fats, fertilizers, fuel and other gases, paints, paper (including wood and pulp), pesticides, petroleum and its products, plastics, poisons, rubber and its products, silicates (rocks, glass, and slag), soaps and detergents, soils, vitamins, and water. The most commonly used methods are described in sufficient detail to permit their performance without recourse to other works. Many of the methods are those recommended by ASTM, AOAC, TAPPI, and the American Oil Chemists' Society.

The index (70 pages) is thorough. The technical quality of the whole work is good. The writing style and the printing are also of high quality, and typographical errors are few. (However, the meaning of "hydraulic calcium silicates" still escapes this reviewer.) Because the text was contributed by 67 authors, it suffers some defects. The bibliographies for the chapters are not uniform. Although they are generally good and modern, the references in some chapters are inadequate or are not tied into the text. There is also some repetition: the Karl Fischer titration is described at least five times, each time at about the same level, and directions for the calcium oxalate precipitation are given in ten different places.

The wisdom of intentionally deemphasizing instrumental methods may be questioned. However, since this deemphasis presumably will be remedied in Volume III, no judgment can be rendered at this time. Overall, however, the preceding shortcomings are trivial in a work of this size. The editor is to be congratulated on the performance of what must have been an arduous and time-consuming task. There is no other single, recent work in the English language that fulfills the same needs of the analyst as this volume does, and it should be made accessible to all practising analysts.

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• *Referee Application*

First Notice. M. M. Phillippe, Shuey & Co., P. O. Box 663, Savannah, Ga., has applied for a Referee Certificate on oil cake and meal. The Chairman of the Examination Board should be contacted by interested parties wishing to comment on this certification. Please write to N. W. Ziels, Chairman of the Examination Board, Lever Bros. Co., 1200 Calumet Ave., Hammond, Ind.