melting point of organic compounds is performed under the microscope, or the conoscope, under various optical conditions.

In addition to the foregoing, its eleven chapters contain an extensive treatise on general optical crystallography and then discussions of such items as single-, mixed- and liquid crystals, iso- and polymorphism, eutectics and application of the microscope for the determination of the refractive index (by means of suitable glass powders) and cryoscopic molecular weight determination.

Of particular interest appears to be the chapter entitled: "Thermo-Analysis" featuring the use of three melting points for the identification of an organic compound. Thus in addition to its own melting point, the mixed melting points with acetanilide and separately, with phenacetine, are determined. Some 1200 organic substances have thus been treated and listed and the statement made (on p. 120) that this opens "almost unlimited possibilities for the characterization and identification of organic substances" and that henceforth the usual "preparation of derivatives is unnecessary." Further positive experimental substantiation of these statements, together with the elimination of the microscope, might really revolutionize organic qualitative analysis.

Unfortunately the literature, although extensive in both sections, is only up to about 1950 in the first and only to about 1940 in the second section. Both subject as well as author index are missing.

The first section is undoubtedly useful to the organic synthesis for rapid selection of the tools and method for a given occasional microchemical task, while the second section appears to strictly cater to the specialist, interested in organic crystallography.

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Polarographic Techniques. By LOUIS MEITES, Assistant Professor of Chemistry, Yale University, New Haven, Connecticut. With a foreword by I. M. KOLTHOFF. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1955. xiii + 317 pp. 16 × 23.5 cm. Price, $6.00.

This is not a book on analytical procedures, nor is it concerned exclusively with the experimental side of polarography. In the preface, it is stated that "It began as a manual of purely experimental techniques, but it soon became evident that these could only be explained rationally by reference to the theory which guides all of our experimental manipulations." In a foreword by I. M. Kolthoff, the aims and objectives are stated to be "to provide a concise practical and theoretical introduction into the field of polarography."

Emphasis is placed on principles which by intelligent application can be used to devise procedures for particular purposes. It contains, in addition to a theoretical introduction to the various aspects of the subject, a wealth of details on experimental techniques which should be of enormous value to the new investigator in helping him to avoid the many experimental pitfalls in this field. A major contribution is a comprehensive list of half-wave potentials and diffusion current constants of inorganic substances published prior to December 1954.

In a book of limited scope, it is inevitable that many important subjects are treated very briefly or omitted altogether. The treatment of reversible current voltage curves is excellent, and apart from an erroneous statement (p. 47) concerning the origin of the factor $\sqrt{7/3}$ in the Ilkovic equation, the theory of diffusion currents is adequate. On the other hand, irreversible waves are hardly treated at all, and it is unfortunate that most of the references to this subject are to material which is relatively inaccessible, or out of date. In particular, references to the recent papers of Koutecky and of Kern would have been desirable. Controlled potential coulometry is handled brilliantly, but unfortunately no mention is made of constant current coulometry or transition time measurements in spite of the fact that space is found for lesser topics such as derivative polarography. The treatment of back pressure of mercury, temperature coefficient of diffusion current, and current compensation techniques could have been condensed to give added space. In the opinion of the reviewer, the single reference to an oscillographic technique for proof of reversibility was not well chosen. Either the triangular voltage pulse (Sevcik) or the superimposed sine wave technique (Breyer, Ershler, Grahame, Randles) would have been more appropriate.

Chapter VI on Maxima and Their Suppression is theoretically weak, although it contains many valuable practical details. The work of von Stackelberg deserves mention.

Practically no emphasis is placed on instantaneous current–time behavior, no doubt because the treatment generally refers to currents measured by a galvanometer. The theoretical treatment of irreversible waves is more straightforward if the "peak current" is measured, and adsorption waves (p. 82–83) as well as certain waves due to film formation clearly show the expected inverted current-time behavior if a high speed recorder is used. Thus the inference (p. 63) that there is no advantage to the use of high speed recorders is misleading.

In the chapter on Amperometric Titrations the impression is somehow created (p. 198) that the over-all accuracy is limited by the accuracy of determining concentration by measurement of current, rather than by the stoichiometry of the reaction and the sensitivity of detection of a small increment of volume. If a similar criterion were applied to potentiometric titrations an entirely erroneous notion of its accuracy would be given. The absence of charging current with a rotating platinum electrode merits mention as contributing to its useful sensitivity. The need for relatively concentrated solutions of titrant is overemphasized, especially for inverted L shaped curves for which no dilution corrections are necessary before the end-point. Complex formation titrations have been applied, contrary to the statement on p. 193. No mention is made of the Sargent "Ampot," an instrument designed for amperometric titrations.

A few minor points: On p. 8, 9, it is stated that for linearity the resistance of the voltage divider "must be very much smaller than that of the cell circuit." Since the cell circuit does not obey Ohm's Law, this requirement is much too rigid, and would be better stated by requiring that the current through the voltage divider must be very much larger than the current through the cell.

The derivation (p. 98) applies to the cathodic as well as the anodic curve of mercurous ion. The term "homogeneous electrode reaction" (p. 99) is not ideal, inasmuch as all electrode reactions are surface reactions and are therefore heterogeneous. The statement (p. 108), "any appreciable variation of $E_{1/2}$ with concentration is conclusive proof of the irreversibility of the reaction" is not true of unsymmetrical waves, for example the anodic wave of thiosulfate. The lack of an inflection around the residual current curve (p. 109) is not as rigorous a condition for reversibility as the coincidence of anodic and cathodic half wave potentials. The proper logarithmic slope of the composite curve should be added as a criterion. The half-wave potential of an irreversible curve depends noticeably on drop time, contrary to the statement on p. 123.

Lest the above criticisms create an unfavorable impression, let it be understood that on the whole the objectives of the present volume have been very well achieved. This work should be a valuable aid to the student and to the beginning research worker as an introduction to the field. The book shows evidence of very careful proof-reading and editing, as evidenced by a remarkably small number of typographical errors (an exception is the wrong sign of E° on p. 129).

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Enzymologie. Eine Darstellung für Chemiker, Biologen und Mediziner. By OTTO HOFFMANN-OSTENHOF, DR. PHIL., Privatdozent am I. Chemischen Laboratorium der Universität Wien. Springer-Verlag, Mölkerbastei 5, Wien 1, Austria. 1954. xvi + 772 pp. 18 × 25 cm. Price, Ganzleinen, $26.65.

In these days of increasing specialization it is common practice to publish treatises under joint editorship and with multiple authorship. The authoritative work on enzymes in the English language today is undoubtedly "The Enzymes," edited by James B. Sumner and Karl Myrbäck

(Academic Press, Inc., N. Y., 1950), which has been published in four parts and contains chapters by over eighty authors. What such a work gains in comprehensiveness and usefulness as an ultimate source of references, it lacks in orderly organization, readability and freedom from repetition. Such works—with the exception of certain well-written chapters—are too detailed, or sometimes simply too imposing to serve adequately as textbooks for students. Thus, a new demand for up-to-date, preliminary or introductory textbooks is being created in fields that have never required them before.

It is a pleasure to find a new work by a single author that covers so thoroughly and well a field as vast and complex as enzymology. Prof. Hoffmann-Ostenhof's book was designed to meet an acute need for a modern German textbook on the enzymes. There is no question that the present volume will fill that need admirably. With respect to scope and coverage, this book is especially noteworthy. Prof. Hoffmann-Ostenhof has managed to keep abreast of and evaluate developments in all of the myriad departments of enzymology that have taken place in America, England, Europe and Asia. Few textbooks can boast, at the time of publication, of as exhaustive a review of the available international literature as this one can.

The first seventeen chapters (170 pages) deal with the history of the subject, with the physicochemical nature of enzymes, their synthesis and specificity, and with enzyme kinetics and thermodynamic considerations. The following thirty-one chapters constitute a catalog of the known enzymes, their properties and reaction mechanisms. In a final chapter of 57 pages the author attempts to portray the role of enzymes in intermediary metabolism, their operation in biochemical sequences and cycles, and their organization in cellular organelles. Such a short chapter cannot pretend to deal adequately with the dynamic aspects of interactions of enzyme systems *in vivo*. This small proportion of space devoted to dynamic considerations in such a large work points up the fact that the book is primarily concerned with enzyme statics, which is justifiable, of course, on the grounds that it is the logical prerequisite for a study of metabolism and cytochemistry at the biological level.

In order to cover so much material within the confines of one volume of 772 pages, the author's style is necessarily concise and condensed. Nevertheless, German-reading students of biochemistry and metabolism will probably find the book rewarding. Unfortunately, however, the price of the book seems prohibitive.

The author is to be congratulated for his success in carrying out such a difficult assignment and in making an important contribution to the international literature of biochemistry.

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Borderland of the Unknown. The Life Story of Gilbert Newton Lewis, One of the World's Great Scientists. By ARTHUR LACHMAN. Pageant Press, Inc., 130 West 42nd Street, New York 36, N. Y. 1955. viii + 184 pp. 14 × 20.5 cm. Price, $3.00.

In the words of the author, this book is "chiefly about Gilbert Lewis" but it includes a considerable amount of *apologia* by the author and much digression. The book is best characterized as an account of the chemistry department at Berkeley in the middle years as viewed from the vantage point of the Faculty Club. It is largely anecdotal in character and those who knew Lewis will recognize the anecdotes as authentic. However, the book does not live up to its pretentious title.

Some years ago a biographer attempted to humanize Willard Gibbs and only succeeded in making both parties appear foolish. Dr. Lachman has done the same thing for Lewis and succeeded too well. The emphasis on Lewis's rather puckish sense of humor seems to diminish his stature as a man and a scientist.

The relation of G. N. Lewis to Willard Gibbs could be the subject of an interesting study. Though he came long after Gibbs he was still his immediate successor and a voice crying in the wilderness, as it were. It is easy to see why he did not use the notation of Gibbs in thermodynamics. But Lewis did not choose to follow the method of Gibbs and this loss of continuity with the great master seems to mar what is otherwise a great work.

Lewis was a non-conformist, even a rebel, as is shown by his resignation from the National Academy. It would be interesting to speculate as to what extent he was affected by his early academic experience at Harvard. His career was a great achievement but in view of his temperament it was inevitable that he would experience disappointment and frustration. This is not to his discredit. He did not suffer fools gladly.

There are those who think that G. N. Lewis was the greatest American scientist after Willard Gibbs and it is to be hoped that eventually a less casual account will be given of his scientific career.

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Elektrolytische Abscheidung und Elektrokristallisation von Metallen. By HELLMUTH FISCHER, Ph.D., Hon.-Professor an der Techn. Hochschule, Karlsruhe. Springer-Verlag, Reichpietschufer 20, Berlin W 35, (West-Berlin), Germany. 1954. xii + 717 pp. 16.5 × 23.5 cm. Price, Ganzleinen DM 72.-.

This book truly constitutes a monumental piece of work standing alone among a vast research literature which Dr. Fischer is the first one to have assembled for presentation in a single volume devoted to the fundamentals of electroplating and electrocrystallization. For the technical aspects of the subject the literature is rather rich (see for instance "Modern Electroplating" published by John Wiley and Co. under the auspices of the Electrochemical Society). The amount of material covered in Dr. Fischer's book is so huge that the presentation is occasionally bound to be a somewhat empirical enumeration of facts and theories. Nevertheless the completeness and up-to-date character of this treatise are admirable and the author displays perfect versatility and ease in the presentation of the many different aspects of his subject. The students of physical chemistry, electrochemistry, metallography and science of metals in general, crystallography, surface chemistry, galvanoplasty, electrometallurgy and of a number of other engineering subjects will all find valuable material in this book and will owe a debt of gratitude to Dr. Fischer for having found the time and energy to write it.

The book is divided into four main parts: 1. Electrochemistry, with six main subdivisions: Fundamentals and definitions. The electric double layer. The diffusion film at the cathode. The mechanism of cathodic plating. The effect of inhibitors. Distribution of lines of current and effect of depth. 2. Electrocrystallization, with four subdivisions: Kinetics of the crystallization process. Mechanism of electrocrystallization. Growth patterns of polycrystalline deposits. Codeposition of non-metals in the cathodic metallic deposits. 3. Chief properties of cathodic metallic deposits, with seven main subdivisions: Bright metallic deposits. Inner stresses in cathodic deposits. Hardness of deposits. Electric resistance. Adherence. Corrosion behavior. Structure and properties of electrolytically deposited alloys. 4. Conditions for deposition and properties of various metals and alloys, with eight main subdivisions corresponding to metals considered in groups (Pb, Sn, Ti–Bi, Sb, As–Ag, Cu, Au–Zn, Cd–Fe, Co, Ni); Cr is considered alone and in great detail, the last two sections being devoted to the conditions of preparation of coatings of the classical Cu–Zn alloys and of the various alloys with Sn.

All the subdivisions of the four main parts are systematically divided in numbered paragraphs, some of which are further divided, with the result that, through the 10-page Table of Contents, the reader can locate easily what he needs in the midst of this abundant fare.

The authors' index of 9 packed pages shows how completely and recently the literature has been covered. A detailed subject index of 56 pages concludes this very fine volume. The printing and quality of paper are excellent.

The reviewer strongly suggests that an English translation of Dr. Fischer's book be made available as soon as possible.

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