

the third chapter about the two-fluid concept and the application of Bose-Einstein statistics to liquid helium, London must often have recalled the happy days in Paris when these ideas came bursting out of him, and of his stimulating contacts at that time with L. Tisza and his many other colleagues. It is in this third chapter, too, that one finds the discussion of the fountain effect, the viscosity studies, and the thermomechanical experiments which were all a part of the prewar era.

The fourth chapter is indeed a great service to all of us because London has done a very capable presentation of Landau's theory about liquid helium, that is, the concept of rotons and phonons. Throughout all this he has enriched the theoretical treatment with well-displayed graphs of the experimental work. The last two chapters are devoted to special topics under the heading: "Two-fluid thermohydrodynamics," and "The helium isotope He^3 ." It is here that one finds such things as the interpretation of the experiments with the Rayleigh disk using thermal waves (or second sound). The author had completed the manuscript for this book in the late winter of 1952, and I remember celebrating with him his revision of the galley proofs and their return to the publishers in late June of 1953—again in Paris! During the month of December 1953, London attended an International Conference on Low Temperature Physics and served as chairman of the session devoted to R. P. Feynman's recent theory of liquid helium. Probably had his health not failed, he would have revised the page proofs to include at least a footnote of what he knew to be important and controversial. It would have been typical of London, for he was a thorough and great scholar. This book is a memorial to his genius and has been fittingly dedicated to his wife, Edith London.

CHARLES F. SQUIRE

Department of Physics, Rice Institute

Chemistry and Biochemistry

Organic Chemistry. Lewis F. Hatch. McGraw-Hill, New York-London, 1955. vii + 324 pp. Illus. \$4.50.

As a palliative for the onus of organic chemistry on "students majoring in home economics . . . agriculture . . . or . . . other fields who do not require a full year . . ." this textbook serves adequately in that it contains the basic elements of the subject, presented appetizingly in a simple readable manner, embellished by numerous photographs and diagrams, and sprinkled with homely bits of humor. The abbreviation necessary in a textbook designed for use in a one-semester or -quarter survey course is accomplished, probably wisely, through broad coverage at the expense of the attention to detail usual for the full-year treatment.

In the first chapter Hatch introduces the reader, by way of the hydrocarbons, to positional isomerism and the nomenclature of aliphatic and aromatic substances, and in subsequent chapters no formal division is made between members of the two broad groups. Of the

remaining 19 chapters, 15 are devoted to the time-honored topics, including the simple classes of organic compounds as well as dyes, proteins, fats, waxes, and carbohydrates. The remaining four chapters, entitled "Enzymes, vitamins, hormones and antibiotics," "Medicinals and pharmaceuticals," "Polymers," and "Organic chemistry and agriculture," are noteworthy since the material included, timely and up to date, should be of special interest to the type of student for whom the textbook is designed.

In general, the number of reactions covered is adequate; the consideration given to the utilization and practical importance of organic materials is ample; and structural formulas, including those of, for example, terramycin, Aureomycin, streptomycin, and chloromycetin, are abundant. The more theoretical aspects of organic chemistry are, however, treated cursorily. For example, two topics that are likely to give trouble to most beginning students, the concepts of resonance and optical isomerism, are covered in two and six pages, respectively. The mechanisms of organic reactions are discussed on occasion.

On perusing the book, I uncovered no typographic mistakes; factual errors are at a minimum and are not of a serious nature—certainly a structure for α -pinene that violates Bredt's rule will not seriously hamper the desired development of the average student in the course.

The book, sturdily bound with an attractive cover, features with each chapter a short list of collateral reading topics and a group of about 10 to 20 problems, without answers, of a degree of difficulty consistent with the probable needs of the course.

EUGENE E. VAN TAMELEN

Department of Chemistry, University of Wisconsin

Electrometric pH Determinations. Theory and practice. Roger G. Bates. Wiley, New York; Chapman & Hall, London, 1954. xiii + 331 pp. Illus. \$7.50.

Everyone measures $p\text{H}$, but relatively few appreciate what it is not. Since the original proposal of Sørensen, a number of suggestions have been made in the attempt to establish practical scales that would experimentally satisfy the ideal definition "negative logarithm of hydrogen ion activity." However, exact agreement has never been achieved because an exact measurement of the true activity of hydrogen ion, or indeed of any single ion species, has not been accomplished. The fundamental difficulty is the existence in any practicable cell of a liquid-junction potential whose magnitude is somewhat dependent on the composition of the test solution, and which is not amenable to rigorous thermodynamic interpretation. Consequently, practical scales of $p\text{H}$ numbers necessarily involve nonthermodynamic approximations that render them distinctly empirical and only in approximate accord with the ideal definition. No one has a more keen appreciation of this situation than Roger Bates, and his discussion of the definitions of $p\text{H}$

scales is the most complete and lucid that I have seen.

Indeed, "complete and lucid" applies throughout this excellent book. All aspects of the definition, measurement, and interpretation of *pH* are treated in an admirably balanced fashion. If you seek information on theoretical fundamentals, you will find it in the first three chapters. If your need is advice on *pH* standards and buffer solutions for calibrating a *pH* meter, chapters four and five will provide it. If you have measured an apparent *pH* number in a non-aqueous test solution and are faced with the question "What does it mean?," you should study the fifth chapter. Perhaps you need to know how to construct and use a hydrogen electrode or a calomel electrode, how to care for a glass electrode, under what conditions you can use a quinhydrone or antimony electrode, how to check the functioning of a *pH* meter and recognize probable cause of malfunctioning, and what simple servicing steps are likely to remedy the difficulty, or the operational principle and equipment used in automatic *pH* control. The book is a rich source of specific, satisfying answers to practical questions of this kind.

Perhaps there are typographical errors, but I have not searched for them. Neither have I examined the binding nor inquired the book's price. Reference books of this quality are the cheapest tools we use. Whatever the price it will be insufficient to provide more than a token recompense to the author for the invaluable contribution he has made.

JAMES J. LINGANE

Department of Chemistry, Harvard University

Glutathione. A symposium. S. Colowick, A. Lazarow, E. Racker, D. R. Schwarz, E. Stadtman and H. Waelsch, Eds. Academic Press, New York, 1954. x + 341 pp. Illus. \$7.50.

This book contains the papers and some of the discussion presented at a symposium held at Ridgefield, Conn. in Nov. 1953. Its purpose is to collect various aspects of knowledge about glutathione that otherwise would remain widely scattered in the literature. It is not convenient to catalog the 29 papers nor to list all 57 contributors, but the scope and significance of the conference can be briefly indicated. The book is divided into four sections: "Properties and organic chemistry," "Methods of detection and assay," "Biochemical mechanisms," and "Physiological and clinical aspects." The first section contains a valuable discussion of the physical and organic chemistry of mercaptans and disulfides as well as several papers devoted to specific aspects of the chemistry of glutathione. The second section is devoted to classical methods of glutathione assay, to paper chromatography, and to histochemical studies on organic sulfur compounds.

The section on biochemical mechanisms is longest and most diverse in the variety of topics considered. It includes papers on the enzymatic oxidation and re-

duction of glutathione, the biosynthesis of glutathione, the role of glutathione in transpeptidation, and a discussion of γ -glutamyl transfer reactions. The role of glutathione as a coenzyme is surveyed, as well as the broader topic of the transfer of acyl groups by sulfhydryl compounds such as lipoic acid and coenzyme A. Also included in this section is an extensive discussion of the role of sulfhydryl groups in mitosis. The last section includes discussions of the relation of glutathione to hormone action, to radiation injury, and to organic and mental diseases. The book closes with good author and subject indexes—a valuable feature that is too often lacking in symposium volumes. Many of the papers have extensive bibliographies so that the book is an excellent key to the literature on glutathione.

In addition to summarizing and documenting available knowledge of glutathione, this book contains interesting comparative information on lipoic acid, coenzyme A, and sulfhydryl-containing proteins, and it may be expected to be of general interest to those working in the fields of biochemistry, physiology, and medical research. The principal faults in *Glutathione* are evidences of imperfect copy editing and proof-reading and a lack of editing of the discussions. One finds questions that are not answered, answers that lack antecedent questions, and obscure and ungrammatical sentences. The latter must be blamed on the authors, because the discussion comments were transcribed from recordings and returned to the authors for revision.

In these days of much advertised conflicts between scientists and the various branches of government, it is very pleasant to find one act of the government that scientists can unanimously acknowledge with gratitude. A major factor in the success of this symposium was the financial assistance granted by the National Science Foundation and the Office of Naval Research. This is of value, not only to the participants in the symposium but to all scientists who may have occasion to read the report of the symposium proceedings.

MARK H. ADAMS

*Department of Microbiology,
New York University College of Medicine*

Micro and Semimicro Methods. Nicholas D. Cher-
onis. vol. VI of *Technique of Organic Chemistry*;
Arnold Weissberger, Ed. Interscience, New York-
London, 1954. xxiii + 628 pp. Illus. \$12.

In this sixth volume of the comprehensive treatise *Technique of Organic Chemistry*, an attempt has been made to give detailed coverage to micro and semimicro methods. How thoroughly this has been done is reflected in the fact that no less than 229 pages are devoted to intimate discussions of laboratory manipulations on the micro and semimicro scale. These cover such topics as crystallization, distillation, sublimation and extraction, measurement of volume, and the determination of other physical constants such as melt-

ing points, boiling points, densities, refractive indices, and molecular weights. These chapters abound in descriptions and diagrams of apparatus, and the intricacies of the latter are so minutely discussed that it is difficult to see how anyone, graduate or undergraduate, could have trouble in using this book in the laboratory as a sort of self-teaching manual. This feature is not accidental but has been introduced by the author who states in his preface that "the number of organic chemists who have practical experience with these procedures is still small."

The second part of the book consists of a systematic collection of preparative reactions. Here again one finds detailed treatment of various micro and semi-micro methods for carrying out such basic processes as reduction, oxidation, halogenation, acylation, esterification and hydrolysis, nitration and sulfonation, amination and diazotization, dehydration, cyclization and condensation. Also included is a short chapter on the use of organometallic compounds, and a longer and interesting chapter on microsynthesis with tracer elements. The material in the latter chapter should be of great practical importance to anyone about to embark upon tracer work, for it contains much sage advice, together with cautions and precautions.

Part three deals very thoroughly with analytic procedures and their underlying reactions. Here are more analytic tests and characterization reactions than are usually studied in comprehensive courses on qualitative analysis. This section also includes a short chapter on the quantitative estimation of functional groups.

Some readers may feel that too much space is devoted to the more elementary features of manipulation and analysis. In my opinion, the book would have benefited by a section dealing with the handling of oxygen-sensitive compounds, such as the carotenoids, details concerning which must still be sought in the original literature. All who read the book, however, will have to agree that the author has done an exceedingly thorough job with the areas covered. It appears remarkably free from error, is well written, and should be of great service to both student and teacher, as well as to the research worker.

EVANS B. REID

Department of Chemistry,
Colby College

Principles of Biochemistry. Abraham White, Philip Handler, Emil L. Smith, and DeWitt Stetten, Jr. McGraw-Hill, New York-London, 1954. xiii + 1117 pp. Illus. \$15.

The four authors of this textbook are experienced teachers and investigators in biochemistry. Through a process of repeated writing, consultation, and revision they have produced a textbook for first-year medical students, no section of which is said to be the work of a single author. There is evident a considerable integration and correlation, not only within the subject field but with other aspects of the student's first year

and with his future studies. The authority of the book is unquestionable. Any disagreement with the presentation will generally be on the basis of emphasis and interpretation.

There are seven parts comprising 50 chapters. The parts are successively entitled "Chemical composition of cells," "Catalysis," "Metabolism," "Body fluids," "Biochemistry of specialized tissues," "Biochemistry of the endocrine glands," and "Nutrition." In spite of the title a large amount of descriptive material is necessarily included and the more difficult abstract and mathematical principles of chemistry applicable to biology are not emphasized. An interesting experiment is the treatment of digestion of each of the great classes of foodstuffs in the chapters devoted to their metabolism, with additional material concerned with digestion appearing under body fluids and elsewhere.

The material includes presentation of as much recent experimental and theoretical work as a textbook can possibly have. References to monographs and reviews are a feature and some individual experimental papers are included. Some working hypotheses, because of their presentation in this book will be regarded by inexperienced readers as well established theories even though the authors have properly qualified their own acceptance. Most teachers in biochemistry find it necessary to take this risk because a connected and reasonable story seems essential in a field where gaps and lacks are many in spite of or perhaps because of the rapid growth of the science.

This textbook will be widely adopted and will have great influence in the medical field. It will fulfill its projected function and will require revision in a few years. This is the fate of nearly all textbooks in biochemistry. At this time it should be seriously considered for use by all who teach biochemistry to medical students.

MILTON LEVY

Department of Biochemistry,
New York University College of Medicine

Physical Measurements in Gas Dynamics and Combustion. vol. IX of *High Speed Aerodynamics and Jet Propulsion*. Part 1, R. W. Ladenburg; Part 2, B. Lewis, R. N. Pease, and H. S. Taylor, Eds. Princeton Univ. Press, Princeton, N. J., 1954. xvi + 578 pp. Illus. + plates. \$12.50.

Rapid advances made during the last decade in the fields of gas turbines and of high-speed flight have been largely based on the development of experimental methods for the study of gas dynamics and of combustion. The present volume, a critical and comprehensive review of these methods, is a most welcome addition to the literature on the subject, particularly since the original contributions are scattered through many technical journals not always available in the same library.

The first part of the volume (340 pp.), under the editorship of the late R. W. Ladenburg, deals with

the measurements in gas dynamics. The second, under the editorship of B. Lewis, R. N. Pease, and H. S. Taylor covers experimental techniques in combustion. Chapter headings give a good idea of the scope of this work. The first part comprises: "Density measurements," "Pressure measurements," "Velocity measurements," "Temperature measurements," "Shock front measurements by light reflectivity," "Turbulence measurements," "Condensation study by absorption or scattering of light," and "Analogue methods." The second part consists of chapters on: "Measurement of flame temperature, pressure and velocity," "Flame photography," "Measurement of burning velocity," "Mass spectroscopy," "Spectroscopy of combustion," and "Analysis of the combustion wave by pressure effects and spectroscopy." These chapters are by leading investigators in the respective fields: A. B. Arons, J. W. Beams, D. Bershader, W. Bleakney, F. P. Bundy, W. M. Cady, P. M. Chambré, G. H. Dieke, G. R. Eber, E. F. Fiock, J. A. Hipple, D. F. Hornig, L. S. G. Kovasznay, R. Ladenburg, L. Malavard, W. T. Reid, S. A. Shaaf, A. H. Shapiro, H. M. Strong, N. Thomas, F. J. Weyl, and E. M. Winkler. The writing is authoritative; the difficulties encountered in making various measurements and the devices by which these difficulties have been overcome or reduced are well presented. A good balance is maintained between the discussions of the principles of the methods used and the descriptions of experimental details. Numerous drawings and halftone plates make it easy to follow presentations. The articles are well referenced throughout and while the reference lists make no claim to exhaustiveness, they seem to have been well chosen and to be entirely adequate.

As is probably unavoidable in a cooperative undertaking of this nature, some duplication and lack of uniformity are noticeable occasionally. Thus the schlieren method and the Mach-Zender interferometer are discussed in both parts of the volume, the second presentation adding little that is not covered by the first. Some comparatively simple techniques are given more space than really necessary although this space could have been advantageously used to describe the more sophisticated methods in greater detail. The reviewer questions a few of the statements made, for instance some of those about active nitrogen (pp. 79-81) or the remark (p. 345) that sound velocity measurements in flames give translational temperature regardless of equilibrium with other degrees of freedom. Such weaknesses, however, are few in number and are not important, since on the whole the volume is extremely well written and gives the reader a clear view of the present status of experimental techniques, as well as preparing him for the study of original literature.

Legibly and attractively printed, this volume should be required reading for all those preparing to undertake research in the important area of physical sciences covered by this series.

G. B. KISTIAKOWSKY

Department of Chemistry, Harvard University

Biological Sciences

Genetic Homeostasis. I. Michael Lerner. Wiley, New York; Oliver & Boyd, London, 1954. vii + 134 pp. Illus. + plates. \$3.25.

In this small volume, the author has undertaken to demonstrate that Mendelian populations have self-regulatory properties, that this genetic homeostasis is related to the better-known developmental homeostasis, and that heterozygosity furnishes a common basis for both phenomena. In developing this thesis, a number of seemingly unrelated lines of evidence are cleverly selected and woven into an extremely convincing argument. The result is probably the most important recent contribution to the literature of population genetics.

Individuals of all species—perhaps to a greater extent among those that are cross-fertilizing—possess regulatory mechanisms that buffer developmental processes against capricious environmental fluctuations. Lerner, through a study of the data bearing on the relation of genotype to environmentally caused phenotypic variation, concludes that heterozygous individuals of a cross-fertilizing species have buffering capacities superior to those of homozygous individuals and, hence, possess "normal" phenotypes more frequently than do the latter. The consequences of this simple hypothesis for populations are far reaching: on the average, heterozygous individuals are favored by selection. Selection, not simple mutation pressure, is primarily responsible for maintaining the genetic variability within populations; the greater the variability, the greater the proportion of heterozygous individuals, and the greater the average fitness of the population. A program of selection, insofar as its aims are met by homozygosity, may be brought to a halt through an unsuspected counterselection for heterozygosity long before the genetic variability of the selected population is exhausted. Responses by populations to novel demands of natural selection are more rapid than they are usually assumed to be under a "homozygous individual" model. In spite of this ability to make rapid responses, the population preserves the ability to revert to its original state (or its equivalent) if the novel demands prove short lived.

As experimental evidence accumulates, details of the arguments presented in this essay will doubtlessly undergo modification. It may be, for instance, that the term *heterozygous* has been used in an operational rather than in a definitive sense. The rather long discussion concerning the pleiotropic effects of genes may eventually appear unduly cautious. Nevertheless, the main argument represents a refreshing approach to problems facing students of both natural and artificial selection; these would do well to take seriously the admonition of the epigraph: "Read not to contradict nor to believe but to weigh and consider."

BRUCE WALLACE

Biological Laboratory, Cold Spring Harbor,
New York