

**The Normal Potential of the Iodine-Iodide Electrode**, by Grinnell Jones and B. B. Kaplan.

P. 2076. In line 18, " $\log f = -373\sqrt{c} + 0.125c$ " should read " $\log f = -0.373\sqrt{c} + 0.125c$ ."

**The Transition Temperature of Carbon Tetrachloride as a Fixed Point in Thermometry**, by James C. McCullough and Harris E. Phipps.

P. 2213. Reference should also be made to an article by Goldschmidt, *Z. Krist.*, **51**, 21 (1912), in which the transition temperature of carbon tetrachloride is given as  $-45 = > 5^\circ\text{C}$ .

**Diketones. I. The Reaction between 4-Phenylsemicarbazide and Acetylacetone**, by Alvin S. Wheeler and R. D. Norton.

P. 2488. The senior author writes, "I wish to state that F. P. Brooks should be included as one of the authors of the paper.—A. S. WHEELER."

**Some 1,2-Dialkyl Cyclopentane Derivatives**, by Francis H. Case and E. Emmet Reid.

P. 3062. In the third line of the second paragraph "2-cyano-2-methyl-cyclopentane-one-1" should read "2-cyano-2-ethyl-cyclopentane-one-1."

P. 3063. In lines 4-5 from the bottom of the page "1-propyl-2-ethylcyclo-ethyl-cyclopentanol-1" should read "1-propyl-2-ethylcyclopentanol-1."

P. 3064. In the first line of the third paragraph of the Experimental Part " $\alpha$ -Ethyl- $\alpha$ -carbethoxy-cyclopentenone" should read " $\alpha$ -Ethyl- $\alpha$ -carbethoxy-cyclopentanone."

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## NEW BOOKS

**Theoretical and Experimental Physical Chemistry.** By J. C. CROCKER AND FRANK MATTHEWS. The Macmillan Company, New York, 1928. viii + 581 pp. 145 figs.  $16 \times 25.5$  cm. Price, \$6.00.

This large book is presented as a combination laboratory manual and textbook as well as a syllabus of physical chemistry for qualifying examinations.

As a laboratory manual it is inferior to the separate practical physical chemistries already published. The details of laboratory technique are inadequately considered and the errors of measurement (their sources, magnitudes and modes of decrease and of correction) are not presented. An insufficient number of experiments is offered, with the omission of such exercises as thermometry, barometry, pyrometry, colorimetry, nephelometry, standardizations of weight volume and balance, specific gravity of solids and volumetry, the effusimeter and the gas balance, velocity of reaction, transition points, glass working and the calculation and plotting of results. Furthermore, the following particular forms of apparatus are omitted: Westphal balance, isoteniscope, Abbé refractometer, immersion refractometer, dropweight surface tension apparatus, Bingham viscometer and plastometer.

As a textbook, it is, in many ways, an excellent presentation. The paper is good, the type is large and the drawings are clear. Practically all the parts of Physical Chemistry are taken up and they are adequately de-

veloped. It is an unusually complete syllabus. However, the instructor will feel the lack of a list of problems and queries at the end of the chapters. The parts of the book have this sequence: gases, spectrometry, constitution and physical properties, chemical energetics, heterogeneous equilibrium, solutions and disperse systems, electrochemistry, chemical kinetics and reactivity and the theory of the atom.

A few minor criticisms should be noted. Illinium is not mentioned although rhenium and brevium are placed among the elements. Cassiopeium is given as an alternate name for the accepted element lutecium. "The Phase Rule" by Findlay is not in the list of reference books on that subject. The applications of active carbon and silica gel are not mentioned. In three-component systems, the right-angled isosceles triangle is used instead of the customary equilateral triangle.

However, the unusual attractiveness and completeness of the book recommend it for every library and for use as a textbook. A particularly meritorious quality is the proportionate development of all the topics in the entire field of physical chemistry so that no part is over-emphasized or neglected but each is given about the same extent of consideration.

RESTON STEVENSON

**Physikalisch-chemische Übungen.** (Manual of Physical Chemistry.) By Dr. W. KUHN, Lecturer in Physical Chemistry at the University of Zürich. Verlag A.-G. Gebr. Leeman and Co., Zürich, Switzerland, 1928. 102 pp. 25 figs. 15.5 × 22.5 cm.

Most of the experiments covered in this small manual are chosen from the old and reliable group. The absence of any work on the densities of gases, and the inclusion of an experiment on the quinhydrone electrode, and of one on the simultaneous effect of two catalysts (iron and copper on the hydriodic acid-persulfate reaction), are perhaps the most novel features. Each experiment or topic is introduced by a concise statement and discussion of the principles involved, these theoretical portions occupying more than half of the book. They are generally well written, though there are a few weak points, such as the prominence given to the long-discredited capillary electrometer method for determining "absolute" potentials, and a serious error on page 11, where the relation between freezing-point lowering and activity coefficient of an electrolyte is stated in a way which is inadmissible even as an approximation.

The experiments themselves are very briefly described and no references are given, so some supplementary information to the student would usually be necessary or desirable. A feature which will recommend the manual to many is the fact that the apparatus required is all comparatively simple and inexpensive.

R. G. VAN NAME

**The Properties of Silica.** An Introduction to the Properties of Substances in the Solid, Non-Conducting State. BY ROBERT B. SOSMAN, Ph.D., Member of the Staff of the Geophysical Laboratory, Carnegie Institution of Washington. American Chemical Society Monograph Series. The Chemical Catalog Company, Inc., 419 Fourth Avenue, New York, 1927. 856 pp. Illustrated. 15.5 × 23.5 cm. Price, \$12.50.

This volume is a comprehensive treatise on the properties of substances in the crystalline and glassy states with special reference to silica. The subject is treated in the following parts: 1, Fundamentals; 2, Phases and their Transformation; 3, Symmetry and Structure; 4, Thermal Energy; 5, Mechanical Energy; 6, Silica in the Electric and Magnetic Fields; 7, Silica in the Periodic Electromagnetic Field; 8, Applications. An introductory chapter on the properties of substances in general is followed by chapters on the constitution and polymorphic forms of silica and their specific properties. The several chapters dealing with properties contain a brief statement of the meaning of the property under consideration; a summarized statement of present knowledge of the property as applied to silica; in some cases, a discussion of the degree of constancy of the "constants" for the forms of silica; a critical review of the experimental work which has led to general statements; and the formulation of hypotheses useful in summarizing the facts already known or in pointing the way to productive research. The author's recognition of the importance of hypotheses in the development of science renders the work of particular value in classifying and interpreting the voluminous literature on silica and in directing future experimentation. His statement of one essential quality of a genuine hypothesis, page 244, is quoted in full as an illustration of the author's point of view. "It [an hypothesis] must not explain the phenomena with too much facility. It is no real virtue in a theory of polymorphism, for instance, that it is capable of explaining not only all the existing data but also any imaginable facts of polymorphism which remain undiscovered. A theory which is capable of explaining all imaginable data in its field is, conversely, incapable of predicting any one experimental fact to the exclusion of any other; or, in the pragmatic philosophy, it is not a theory at all but a form of words. It has happened more than once in the history of science that two formulas which sounded very different, but whose corollaries were experimentally indistinguishable, have led to needlessly long and bitter polemics. Hence it will be well to devote our closest scrutiny to the deductions that follow from a given hypothesis, rather than to the plausibility and general attractiveness of the formulation itself."

In the presentation of the subject matter the author has made free use of section and paragraph headings and of carefully prepared tables and illustrations. The completeness and authoritative character of the book render it indispensable to those interested not only in the specific proper-

ties of silica but in the general characteristics of substances in the solid, non-conducting state.

HARRY B. WEISER

**The Modern Calorimeter.** By WALTER P. WHITE, Ph.D., Physicist in the Geophysical Laboratory of the Carnegie Institution of Washington. American Chemical Society Monograph Series. The Chemical Catalog Company, Inc., 419 Fourth Avenue, New York, 1928. 194 pp. 16 figs. 15.5 × 23.5 cm. Price, \$4.00.

“The whole plan of the present book illustrates one method in scientific work, namely, the guidance of experimentation by analysis of the various physical processes and sources of error concerned. . . . Its main idea is not instruction, though it should have some value as such, but the development of the subject through criticism and discussion. . .” In these words, the author strikes the keynote of the book.

Probably no technique in physical chemistry has ever been subjected to more careful scrutiny nor more scholarly analysis than has calorimetry in this book by Dr. White. The author has rendered a real service in collecting together in one convenient place all his work of the past twenty years in this field.

The book will not be read easily by the casual reader. The new worker in calorimetry would prefer to find specific directions for making a calorimeter, gladly accepting arbitrary, authoritative statements in which the author could rightfully indulge. But such is not the purpose of the book. The author gives all the factors which must be considered and references to modern literature but he does not give exact dimensions, nor the way to wind and insulate a heating coil, nor how to set the leads into the cover. In fact very few experimental data are included and in no case is an actual thermochemical experiment with its calculation given.

The investigator in this field may be confused by the large number of suggestions. He may prefer to plough ahead and amass data, evaluating his accuracy by experimental tests with his own apparatus under his own working conditions. He may rely on checking his results with accepted values and thermodynamic relations. But this is exactly the author's point—he warns the experimenter against starting his work until he has all the variables clearly before him. This careful, deductive analysis of errors emphasized by Dr. White should more often precede careful experimental work in all fields of research.

Not every worker in calorimetry will agree with the author in the relative evaluation of various factors but all workers will unite in expressing appreciation for the scholarly treatment and helpful collection of material.

In the first chapter the author gives an excellent discussion of errors, which is equally applicable to any experimental work. He distinguishes

clearly between accidental and systematic errors and between accuracy and delicacy of measurement.

The various sources of error in calorimetry are discussed fully—radiation, convection, evaporation, adsorption, conduction, heat of stirring, time lag and thermal lag. Then follows a description of various methods including the constant temperature jacket, the adiabatic method, the vacuum-walled calorimeter, the twin calorimeter and the aneroid calorimeter. Special apparatus is fully discussed, including covers, stirrers, convection shields, leads and electrical connection, but detailed descriptions are not given. The last chapter summarizes in a very satisfactory manner the precautions necessary for different degrees of precision from 1 part in 300 to 1 part in 10,000.

Accessory manipulations are not given. The discussions are limited to "the measurement of heat by means of temperature change in suitable bodies." Accordingly no mention is made of heat of combustion, heat of mixing or heat of vaporization or specific heats or the flow method of calorimetry.

The book is well organized and free from errors.

No one should undertake a research in calorimetry without first studying this book.

FARRINGTON DANIELS

**Bibliography of Crystal Structure.** BY JARED KIRTLAND MORSE. Bulletin of the Crystal Structure Laboratory, Department of Physics, Ryerson Physical Laboratory, University of Chicago. The University of Chicago Press, Chicago, Illinois, 1928. xix + 164 pp. 8 figs. 15 × 23 cm. Price, \$3.00.

This new monograph contains the following sections: an introduction, six papers originally published in the *Proceedings of the National Academy of Sciences* and a bibliography of crystal structure. The introduction describes the facilities, program and aspirations of the Crystal Structure Laboratory at the University of Chicago, ending with a somewhat thinly veiled solicitation of funds for the establishment of research fellowships and assistantships for the Laboratory. The papers represent the contributions from the Laboratory and with the exception of one devoted to the space group of potassium, rubidium and cesium sulfates, are very largely the theoretical deductions of the author of the monograph, particularly the structure and dimensions of the benzene ring and of ethane and methane. The bibliography is arranged alphabetically by authors under each year from 1912 to 1927. It is based admittedly on the bibliography published by Dr. Wyckoff in 1924 and brought up to date. This bibliography will undoubtedly prove useful to some workers in the field of crystal structure, although arrangement by subject matter such as is found, for example, in the "International Critical Tables," presents data

in a more readily available form. No bibliography can be expected to be perfect in completeness, and in the present instance there are numerous omissions, particularly of papers the titles of which may not clearly indicate x-ray studies. Although the abbreviations for periodicals recommended by *Chemical Abstracts* are used, some of the spellings of chemical terms adopted by the American Chemical Society are overlooked. For example, "caesium" is used instead of the approved "cesium" and "sulphate" instead of the approved "sulfate." The price of three dollars for this paper-bound monograph is undoubtedly too high, particularly inasmuch as the volume seems to be designed as a missionary for the author's laboratory. It seems, therefore, that in spite of the very evident painstaking work of Dr. Morse in preparation, the circulation and utilization will be limited.

GEORGE L. CLARK

**Photometric Chemical Analysis (Colorimetry and Nephelometry).** BY JOHN H. YOE, Ph.D., Professor of Chemistry, University of Virginia. Volume I, **Colorimetry.** John Wiley and Sons, New York, 1928. xxi + 771 pp. 72 figs. 15.5 × 23.5 cm. Price \$8.50.

This welcome addition to the reference books of analytical chemistry possesses many features which will be of interest to those who frequently have occasion to use colorimetric methods. The first seven chapters are devoted to a discussion of the general principles of colorimetry, colorimeters, methods of calculation, calibration errors, colloids and colorimetric stabilizers. Parts II, III and IV deal with the estimation of inorganic, organic and biological substances. Part V comprises a very extensive bibliography (181 pages) of the literature of colorimetry. The bibliography not only lists the publications bearing upon the subject, but is made much more useful by including with each reference a summary of the important points of the investigation. Under the methods of analysis each determination is discussed in detail, so that reference to the original article is rendered practically unnecessary. The discussion of each method usually includes notes which are of value in deciding upon its applicability. While the book is unusually complete and encyclopedic in character, it would have added to its value considerably had the author adopted a more critical attitude. The evaluation of a single method where several different methods are discussed for the determination of a given substance is left to the judgment of the reader. This, however, was apparently not done without deliberation. "The author earnestly hopes that workers in this field will cooperate in improving (and 'weeding out' if necessary) some of the less accurate and imperfectly studied methods given in this treatise. It is mainly with this idea in mind that these procedures have been included." The book is well indexed and type and binding are excellent.

LAWRENCE T. FAIRHALL

**Organic Chemistry for Advanced Students.** BY JULIUS B. COHEN, Ph.D., D.Sc.; F.R.S., Emeritus Professor of Organic Chemistry in the University of Leeds. Fifth edition. Longmans, Green and Co., 55 Fifth Avenue, New York, 1928. Three volumes. Part I, **Reactions.** vii + 427 pp. 5 figs. Part II, **Structure.** vii + 487 pp. 63 figs. 2 plates. Part III, **Synthesis.** vii + 440 pp. 14 × 22 cm. Price, \$6.00 per volume.

The fifth edition of this well-known work is composed in essentially the same manner as the earlier editions. The same subjects are now discussed more fully, with the inclusion of recent material to bring the treatment up to date. Certain new subjects are introduced and constitute additions to the structure which supports the substance—but the structure is recognizably the same. Professor Cohen originally made an excellent choice of the significant facts and theories of organic chemistry. With each new edition he has, in general, treated the same features of the science, expanding the discussion as indicated by new research in the particular fields. He has exercised good judgment in the addition of significant new material. The work may perhaps be criticized for not making mention of certain new developments—chaulmoogric acid, high-pressure synthesis of methanol, etc., and organic compounds of germanium and lead, to specify a few of the omissions. It may be criticized for including in this fifth edition too much discussion of certain topics which were undoubtedly of prime importance at the time of the appearance of the first edition. Tautomerism is not now as mysterious as it used to be; its phenomena may be generalized and the wisdom of distinguishing various types of tautomeric change may perhaps be questioned. The relative merits of the several formulas early proposed for benzene have not been a live issue since Thiele proposed his doctrine of partial valence. Too much discussion of such matters gives the student a false idea of the present status of organic chemistry. Paradoxical as it seems, the science by dealing with an increasing diversity of facts is attaining a simplicity of point of view and an increasing power of correlation. A textbook which will make this situation clear to the student is now needed.

The faults of Cohen's work increase its value for certain purposes. The first chapter of the first volume is the best survey in English of the early history of organic chemistry. No student can read the entire three volumes without gaining an excellent idea of the history of the most important theories and lines of research. He will see how mankind has acquired the present science—and that seeing is probably the best way by which he may acquire the science for himself. He may or he may not chance to notice that the organic chemistry so acquired comprises, like the chemistry of the time of Robert Boyle, not only gold, and silver, and ivory, but apes and peacocks, too. Advanced students of organic chemistry have need of a textbook in which all of the important facts are suggested, all of the important lines of research are indicated, in which—apes and pea-

cocks thrown overboard—all of the important correlations are set forth in a simple manner.

Volume I, entitled "Reactions," deals with the valency of carbon, the mechanism and dynamics of organic reactions and with abnormal reactions. Its most noteworthy new material is on the electron theory of valence, in particular on its application to aromatic compounds. Volume II, entitled "Structure," deals almost entirely with the relations between chemical constitution and physical properties, density, color, optical activity, etc., with the various types of isomerism, and with the structure of benzene. It contains new material on Sugden's principle of the "parachor," on the Walden inversion and the pinacoline rearrangement, and on the stereochemistry of the hydro-aromatic compounds and of organic compounds of inorganic elements. Volume III, entitled "Synthesis," deals with special types of complex molecules, the carbohydrates, enzyme action, the purines, proteins, terpenes and camphors, and the alkaloids—and appears to the reviewer to treat the special subjects in a well-balanced and adequate manner. The arrangement, however, is one which might well confuse a student. Substitution in aromatic compounds is discussed in one volume, the structure of benzene in another. If our knowledge of structure is gained from an observation of reactions, and if it is the mechanism of reactions which indicates the possibilities of synthesis, then the student will wonder how reactions, structure and synthesis can be treated separately, and will probably feel—as the reviewer does—that some other manner of subdividing the subject would result in greater fluency of understanding. The work suffers from having been revised, not that the revision hasn't been well done upon the old structure, but that some other structure—some other topical outline of the subject—would be better.

The books are well printed and are equipped with adequate subject and author indexes.

TENNEY L. DAVIS

**Aids to Biochemistry.** BY E. ASHLEY COOPER, D.Sc., F.I.C., A.R.C.S., and S. D. NICHOLAS, B.A., A.I.C., Lecturers in Chemistry, University of Birmingham. William Wood and Company, 51 Fifth Avenue, New York, 1927. vii + 188 pp. 12 figs. 11 × 16.5 cm. Price, \$1.50.

This book was written to present the general principles of biochemistry to medical and science students who have already studied the subject by means of larger textbooks or lecture courses. It is intended primarily for "purposes of revision." The subject is arranged both for reading and as a manual for experimental work.

The success of such a work for revision, or review, of specific courses of study depends upon the extent to which the material presented parallels that given in the study courses. This book will probably not appeal to



those in this country who are prone to follow course work. On the other hand, it should prove valuable to one who desires short, concise statements of the fundamental facts and tests of biochemistry. The material is well and accurately presented; there are included chapters on naturally occurring amines and amides, biochemical mechanism of physiological action (disinfectants), alkaloids and tests for alkaloidal compounds and identification of organic compounds which are not usually met in biochemical books current in this country.

PAUL E. HOWE

**A Textbook of Biochemistry for Students of Medicine and Science.** BY A. T. CAMERON, M.A., D.Sc. (Edin.), F.I.C., F.R.S.C., Professor of Biochemistry, University of Manitoba. The Macmillan Company, New York, 1928. x + 462 pp. 12 figs. 2 plates. 14 × 21 cm.

The material is divided into seven sections as follows; Introduction and some Physical-Chemical Conceptions, Chapters 1-3; The Food-stuffs, their Derivatives and Related Compounds, Chapters 4-11; The Chemistry of Digestion, the Circulation and the Excreta, Chapters 12-18; Intermediate Metabolism, Chapters 19-28; The Chemistry of Reproduction, the Chemical Controlling Agencies of the Organism, Chapters 29-30; Quantitative Metabolism, Chapters 31-32; and a supplementary section with chapters entitled, An Introduction to the Chemistry of Immunology, The Utilization of Biochemical Processes in Industry and A Biochemical Introduction to Pharmacology. This is a first-class textbook with few errors and few misleading statements. After having read on p. 36 that from the crystal form of osazones "it is possible to identify the sugars that give rise to them" the student will be disappointed to read later that three of the four important hexoses give the same osazone. It is evident from the discussion on p. 162 that the author is unfamiliar with Cleveland's study of the role of protozoa in digestive processes in termites. In the discussion of the buffering system of the blood on pp. 201-205 the role of carbonic acid is given due attention but the importance of proteins is minimized. Strangely enough in a table on p. 177 showing the composition of normal human blood carbonic acid is classed simply as a waste product. The amounts of sodium and potassium in blood are correctly given in this table but an incorrect ratio of the two in blood is given on p. 347. Aside from a few such errors as these, there is ample proof of a thorough knowledge of biochemical literature. The subject matter is presented logically and in good style. This textbook should be particularly useful to the student of biochemistry seeking reliable information of a general character unaccompanied with unwarranted speculation.

D. B. DILL

**Biologische Kolloidchemie.** (Biological Colloid Chemistry.) BY DR. RAPHAEL ED. LIESEGANG. Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1928. xii + 127 pp. 15.5 × 22.5 cm. Price, unbound, RM 8; bound, RM 9.50.

The author of this monograph covers a large field of literature inspiring those who search for problems still open for research, and with a very personal shade. The following chapters are treated: the colloidal medium of organisms, changes of dispersity, electric charge adsorption, swelling, surface tension, viscosity.

L. MICHAELIS

**Physiology and Biochemistry of Bacteria.** Volume I. Growth Phases, Composition and Biophysical Chemistry of Bacteria and their Environment and Energetics. By R. E. BUCHANAN, Ph.D., Professor of Bacteriology, Iowa State College and ELLIS I. FULMER, Ph.D., Professor of Biophysical Chemistry, Iowa State College. The Williams and Wilkins Company, Baltimore, Maryland, 1928. xi + 516 pp. 78 figs. 15.5 × 23.5 cm. Price, \$7.50.

After a brief introductory statement, the subject matter of this book is divided into four chapters dealing, respectively, with growth phases, chemical composition, physico-chemical characteristics and energy relationships. Presumably, a consideration of bacterial enzymes, nutritive requirements, products of growth and so on are to be covered in a second volume. It is apparent on cursory inspection that at least one of the authors is a mathematician and physico-chemist who seems, in obeying his impulse in favor of mathematical treatment, to have to a great degree lost sight of the stated subject of the book. The reviewer does not wish in any way to minimize the importance of a mathematical treatment, however involved, of any biological phenomenon which thereby may be clarified. The reasons for his criticism of Buchanan and Fulmer's book will perhaps become clearer after an analysis of the contents.

The chapter on growth phases concerns itself with a subject upon which the authors have in the past done considerable experimental work and there may be justification in treating this at length, and mathematically. On the other hand, the chapter by the same authors in Jordan and Falk's recent book, together with the original papers which are available in most libraries, would appear adequately to cover the ground.

The chapter on chemical composition, some 75 pages in length, brings together a mass of material on this still relatively obscure subject. Many of the references are very old, and little critical analysis of the facts appears to have been attempted, nor is there any relationship evident between space allotment and importance of the various topics. For example, a consideration of bacterial pigments covers 20 pages, while "bios" is dismissed in two paragraphs. Thirteen pages are devoted to a discussion of carbohydrates and gums, of which an extremely inadequate

account of the recent work of Heidelberger, Avery and others occupies only half a page. It must be obvious to most students who have followed this subject that both the chemical and biological work done on the polysaccharides of, for example, the pneumococci far outweighs both in accuracy and in significance any reports on the same subject preceding the year 1923.

The chapter on physico-chemical relationships covers some 230 pages, of which perhaps 25 pages deal with bacteriology in any apparent way. Surface tension, for example, is considered at some length, but with only occasional references to possible applications to bacteriology. Reference is made to the meiostragmin reaction on page 156 and again on page 172, but not by name, nor with any reference to Ascoli and Izar's work in 1910, since which the method appears to have been no further investigated. It would seem, moreover, that some review of the recent work by Larson and others on soaps in bacterial cultures should have been undertaken. The chapter contains, in all, about 150 numbered equations, and some 65 tables of physical constants, etc. If the gas laws and one or two other matters had been included, it might well serve as a textbook of physical chemistry.

The last chapter commences with a consideration of laws of motion, units of force and work, and a table of the values of the gravity constant at various positions on the earth's surface. This is followed by a long mathematical discussion of energy in its various forms, chemical thermodynamics and entropy. The book ends with an excellent compilation of existing information on the energy sources available to, and types of oxidation used by, bacteria. It might, perhaps, have been well to include some account of the work of Hopkins and his collaborators in connection with the mention of "phiothion" on page 434, but in a bacteriological book this omission is not serious.

To the reviewer it seems that the field of physiology and biochemistry of bacteria is full of fascinating and important problems, many of which can here be investigated under optimal experimental conditions, and may have intensely significant bearings in broader fields. For this reason, he feels that a short book, so written as to stimulate interest rather than to discourage it, which would collect into compact form all the available information in a really critical way, would be of great value. The present volume falls far short of attaining this end. There are plenty of authoritative textbooks of physical chemistry and physics to which the earnest student of biology can readily go for the information he needs in a specific problem. The difficulty in Buchanan and Fulmer's book is to pick out from the mass of mathematics the biological facts which he may require.