solution of 0.38 g. of the hydrocarbon in ether was shaken for three hours with 4 cc. of the liquid sodium–potassium alloy in an atmosphere of nitrogen. The solution turned red in one minute. Dry carbon dioxide was led into the mixture until the red color had disappeared, and then the ether solution was poured off and any suspended particles of alkali metal were decomposed with moist carbon dioxide. The ether solution was then extracted with water and the aqueous extract acidified with dilute hydrochloric acid. Only a slight turbidity resulted. Evaporation of the ether layer with dilute hydrochloric acid left only potassium and sodium chlorides.

Attempts to Rearrange the Hydrocarbon $C_{38}H_{38}$.—A solution of 0.44 g. of the hydrocarbon in 5 cc. of absolute alcohol was heated for one hour in a sealed tube at 100°. The solution was cooled to 15° and the original hydrocarbon (m. p. 150–151°) was isolated. The recovered hydrocarbon weighed 0.36 g.

Summary

1. Molecular silver removes the halogen from diphenyl-*tert.*-butylethynylbromomethane, and a hydrocarbon $C_{38}H_{38}$ is obtained when the reaction is carried out in air or nitrogen. In an atmosphere of oxygen this reaction does not produce a hydrocarbon but oxygen is absorbed very rapidly by the reaction mixture.

2. The hydrocarbon, $C_{38}H_{38}$, reacts with liquid sodium–potassium alloy and with 40% sodium amalgam to produce colored alkali metal derivatives but apparently the molecule is not cleaved as would be expected if it has the structure of tetraphenyldi-*tert.*-butylethynylethane.

3. To explain these observations the suggestion is made that tetraphenyldi-*tert.*-butylethynylethane is formed by the action of silver on diphenyl-*tert.*-butylethynylbromomethane but it rapidly dissociates and rearranges to some other more stable structure. If oxygen is present in large amounts the free radicals produced by the dissociation of tetraphenyldi-*tert.*-butylethynylethane are oxidized before this rearrangement occurs.

URBANA, ILLINOIS

NEW BOOKS

An Introduction to General Chemistry. By WILLIAM MARTIN BLANCHARD, Ph.D., Professor of Chemistry, De Pauw University. Doubleday, Doran and Company, Inc., Garden City, New York, 1928. ix + 588 pp. 90 figs. 11 plates—nearly full page photogravures of famous chemists. 10 charts. 14 × 21 cm. Price $3.00.

In the preface the author states that in the preparation of the text he has made his constant guide those difficulties with chemistry encountered by the average college student, and that he has endeavored to present the more common facts and fundamental laws and theories of general chemistry in a clear, concise and orderly fashion. The product of his efforts adds another ranking member to the rapidly growing list of conventional texts written for first year college students of general chemistry. The

author is conservative in the choice of topics, adhering to the usual content and order but he defers the study of ozone and hydrogen peroxide till the chapter on selenium and tellurium is reached. Chemical equations are introduced almost at the outset in Chapter 2—Oxygen. In chapters 1 to 15 inclusive each topic is taken up and developed in logical sequence with new inquiries growing out of topics that preceded. Most of the fundamental theories and principles are incorporated in these chapters. Beginning with chapter 16—Sulfur and Hydrogen Sulfide—the book becomes mainly descriptive. Throughout the book the practical applications—old and recent—are introduced. The student must thus become impressed with the debt our present-day complex society owes to the pioneers in chemistry.

Nowhere in the volume does the author indulge in any unusual tactics to capture the interest of the reader but he maintains a clear, simple, logical development which will help the student over many difficulties. Each chapter closes with a set of thought questions and exercises but no answers are given to problems. Neither have simple literature references been introduced to guide and stimulate the wide-awake student in supplementary reading. Some of the exercises, however, will send the student to the reference library. For example, while but scant attention is given to primary cells, nevertheless, p. 481, the student is asked to explain the operation of the zinc–zinc sulfate–copper–copper sulfate cell; and on p. 531 he is directed to look up the latest reports on chromium plating.

Radioactive changes and the structure of the atom are logically presented in the chapter with the periodic law, but much more could be done later in applying the electron concept to electrolysis, ionic reactions, oxidation and reduction, primary cells. A thorough integration of electron transfer and sharing into these topics has not been attempted. The proton is not mentioned; instead, hydrogen nucleus is used. The admixture of electrons with explanations given largely in terms of positive and negative charges, rise and fall of valence, etc., so common in this transition period to most of our texts, is bound to be rather confusing to the neophyte whose radio contacts have already made the electron a reality.

The proof reading has been well done and little mistakes are few in number. The opening of sentences with the pronoun "this" could be curtailed to advantage; charcoal is spoken of as a good conductor of electricity, p. 313; electrons in discharge tubes do not attain the velocity of light as stated on p. 179; Millikan's classical experiments established the value of the charge on the electron not its mass, p. 179; the millimicron should not be represented by the double letter, $\gamma\ \gamma$. The laws of Boyle and Charles, p. 30, are not stated in their usual precise form; Cl^- and OH^- are called chloride and hydroxide ions; the Avogadro number appears to have been overlooked. The omission of the now obsolete laws

of multiple and reciprocal proportions, p. 50, would be of no serious harm to the atomic theory and would remove a distressing hazard from the joyous progress of the average freshman.

The chapter on "The Colloidal State" is well written. Experimental evidence is introduced repeatedly establishing the molecular formulas of gases, *e. g.*, oxygen, hydrogen sulfide, sulfur dioxide, ammonia, nitrous oxide. The theory of ionization in aqueous solution is presented early—chapter 14, p. 148—but subsequently ionic equations occur only here and there. Figures of apparatus have been greatly simplified and rarely show the complete set-up. The principle of Le Chatelier is stated in unusually simplified form, p. 276, but in the examples cited the old terms "strain" and "stress" make their appearance. Some instances are given of the interesting parallel between the reactions of substances with liquid ammonia and their reactions with water, p. 257.

Finally the reviewer ventures to repeat the question raised by Kendall in the preface to Smith-Kendall, "General Chemistry," "Is not the time ripe to begin to reduce the amount and variety of material offered to first year college students in chemistry?" Few indeed are the teachers who have classes which are able to cover in a satisfactory way the whole of the material contained in the standard college texts. Should not the emphasis be shifted somewhat too by omitting altogether a large bulk of the descriptive material offered in the chapters which generally follow sulfur and hydrogen sulfide, and substituting therefor more about the recent marvelous advances which modern chemistry is making?

HERMAN SCHLUNDT

First Principles of Chemistry. By F. W. DOOTSON, M.A., Sc.D., F.I.C., University Lecturer and Demonstrator in Chemistry, Cambridge, and A. J. BERRY, M.A., Fellow of Downing College, University Demonstrator in Chemistry, Cambridge. University Press, Cambridge, England, 1927. vii + 339 pp. 43 figs. 13.5 × 20 cm. Price, $2.00.

This textbook is designed more particularly for the use of students who practically begin the study of chemistry at the University. It is to be studied as an adjunct to the lecture method of teaching, and should conserve the time taken up by writing notes in class and secure better attention to the demonstrations.

General principles and general methods are emphasized, and details have only been stressed where they have a special significance. But little attention is given to the Periodic Law, "while the now obsolete Laws of Multiple and Reciprocal Proportions have been omitted altogether." The Law of Definite Proportions, however, is stressed in the introductory chapter and illustrated by two sets of well chosen experiments. At the outset the student is introduced to the atomic theory, the chemical equation, Avogadro's theory, isotopes, heats of reaction.

In Chapter II, on water, hydrogen, oxygen, etc., water is studied first, and here we find introduced among other topics, the phase rule, Le Chatelier's theorem, aqueous solutions, water softening. This chapter also includes Gay-Lussac's Law of Combining Volumes, hydrolysis, equivalent weights, the laws of Boyle and Charles, reversed combustion.

The Ionic Theory is deferred to Chapter 10, p. 249, and its applications are introduced in the next chapter on "Metals and Their Compounds." The closing chapter, 12, describes methods of determining molecular and atomic weights.

The book contains many refreshing passages and several elegant lecture demonstration experiments are described. The various chapters contain none of the modern teaching devices, such as thought questions, problems, literature references, etc. A knowledge of logarithms is assumed in expressing hydrogen-ion concentration in terms of P_H values. The book serves the purpose for which it was written but it is probably not adapted for freshmen in this country who have had a year of high school chemistry.

On p. 106 the boiling point of iodine is given as lower than its melting point; the reverse is true. The reviewer questions the statement on p. 17 that the compression of water by the pressure of the atmosphere results in a lowering of the general sea level by rather more than one hundred feet.

HERMAN SCHLUNDT

La Notion d'Espece en Chimie. (The Idea of Molecular Species in Chemistry.) By JEAN TIMMERMANS, Professor of Physical Chemistry at the University of Brussels. Gauthier-Villars et Cie., 55 Quai des Grands-Augustins, Paris, France, 1928. iii + 134 pp. 15 figs. 14 × 22 cm.

This little book undertakes a discussion of the most favorable conditions for the determination of physical-chemical constants. Its three main divisions are devoted to answering three questions. 1. How is a physical-chemical system to be defined unambiguously?—the problem of molecular species in chemistry. 2. How is such a system to be realized?—the problem of pure substances. 3. How are the constants to be measured with precision and exactness?

The first section outlines in interesting fashion the historical evolution of the idea of molecular species and the application of the phase rule to both simple and intricate cases. Section two discusses the meaning of the term pure, methods of dehydration, the theory of fractional distillation and of fractional crystallization and the limitations of methods used for these latter operations. Part three contains a discussion of the ultimate standards in use, the theory of least squares as applied to experimental data and a list of the principal national laboratories undertaking the determination of constants. There is also a list of the principal reference

tables on physical–chemical constants. The chapter on the evaluation of existing data, with benzene taken as an example, is particularly interesting.

The limitation of the text to a little over a hundred pages has of course made it necessary that the theoretical treatment be frequently dogmatic rather than explicit, and the quotation of specific data meager. Necessarily also the matter contained can hardly be new to experts, and is too condensed to suffice for novices in the field. Nevertheless it will make most interesting and most helpful reading to both classes, for nowhere has there been in a single publication such a complete codification of the conditions and the problems to be kept in mind by the experimenter during the work of measuring physical–chemical constants.

ARTHUR E. HILL

Grundzüge der Körperlehre. (The Basis of a Science of Material Objects.) BY DR. J. V. HOFMANN. Emil Pahl, Dresden, 1926. Portrait. vii + 80 pages. 15.5 × 23.5 cm. Price, $1.00 net from the son of the author, William E. Hofmann, 1849 Bronxdale Avenue, New York City.

This book contains three popular lectures delivered in 1870 by Joh. Val. Hofmann (a German private scholar who was not connected with a university) in exposition of the views which he had earlier set forth in his "Somatologie oder Lehre von der inneren Beschaffenheit der Körper," Göttingen, 1863. It contains a polemical chapter in which evidence is given that Kirchhoff adopted and put forward as his own in 1865 the views which Hofmann had set forth in his book. Also, it prints a letter, with facsimile, from Professor Carl Naumann in acknowledgment of the dedication of the book to him.

Hofmann speculated about the density of atoms and about the spaces between them, etc. He held that the purely mechanical theory of heat as then recently developed by Mayer, Joule, Thomson and Helmholtz is inadequate to account for the phenomena of physics and chemistry—and that the particular properties of the kind of matter which is involved must be taken into the reckoning. He was apparently the first to see the necessity for a special science—Somatology—which should develop from the same causes the phenomena of chemistry, of crystallography, and of physics. To that extent he laid the early foundations for the work of van der Waals, Richards, Bragg and Bohr.

The present little book does not contain any very remarkable deductions. It has some reasoning which appears to be fallacious. But it is an important historical document for the reason that it shows the feeble beginnings of the speculations and experimentation which are giving to the science of the structure of matter the status that Hofmann (and Kirchhoff) thought that it deserved.

TENNEY L. DAVIS

Mechanische Eigenschaften flüssiger Stoffe. Volumen, Dichte, Kompressibilität, Oberlächenspannung, Innere Reibung. (**Mechanical Properties of Liquid Substances.** Volume, Density, Compressibility, Surface Tension, Viscosity.) By R. KREMANN, Professor at the University of Graz. Handbuch der allgemeinen Chemie, Band V. Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 4, Leipzig, Germany, 1928. xii + 597 pp. 75 figs. 18 × 25.5 cm. Price, unbound, M 46.50; bound, M 49.

The scope of this work is indicated by the subject matter treated in the various chapters. The first main division, on volume relations of liquids, includes relation of volume to pressure, temperature and constitution, and volume relations of binary mixtures. In the second main division, dealing with viscosity, the topics dealt with are: general discussion and definitions, methods and apparatus, influence of temperature and pressure, turbulent flow, relation between viscosity and other properties and its dependence upon chemical constitution, the viscosity of mixtures and various applications of the measurement of viscosity. Under surface tension the topics treated are general discussion and definitions, methods of determining surface tension, the effect of temperature, pressure and other variables, the relation to chemical constitution, the surface tension of mixtures and solutions, and further applications for the measurement of surface tension.

The author's own labors in these fields have well prepared him for the monumental task which he has accomplished. Anyone at all familiar with the literature in any one of the three main fields treated is aware of the enormous amount of work involved in its presentation in book form. The scope of the book and the extent of the literature covered by it have naturally made it necessary to write a résumé rather than a highly critical presentation. While this is a disadvantage from certain points of view, it will greatly aid a research worker in these fields in surveying the large amount of work previously done. Incidentally it is likely to impress him with the unsatisfactory character of much of it, and with the great need for a concerted attack upon the problems of the liquid state, for it is surely true that our knowledge of the liquid state of matter is far less satisfactory than that of the gaseous and solid states. Over and over again one discovers that the only formulation of certain relationships is in terms of the notoriously inaccurate van der Waals equation. A perusal of this book should serve to suggest many important researches, which is perhaps the highest service such a work can perform.

It may seem captious to complain of omissions from a book which represents such a stupendous review of physico-chemical publications; but the reviewer has felt, in reviewing this as well as other continental publications, that some of the work done on this side of the Atlantic is either absent from European libraries or receives but casual attention. To mention only two examples: in reviewing the effect of pressure upon surface ten-

sion, there is no reference to the thermodynamic formula given by Lewis and Randall; and in connection with the surface tension of metals, values obtained by Siedentopf in 1897 are used rather than the values of Hogness obtained in 1921. There are also instances where the author has been content merely to state a discrepancy or to quote contradictory opinions, although some of these matters, to the reviewer's knowledge, have been critically discussed in American publications. The reviewer does not wish, however, that these remarks should be taken too seriously, for he realizes that any work of such scope prepared by a single author would be subject to similar criticism.

JOEL H. HILDEBRAND

Reaktionskinetik gasförmiger Systeme. (**The Kinetics of Chemical Change in Gaseous Systems.**) BY C. N. HINSHELWOOD, Lecturer at Oxford University. Translated by Dr. ERICH PIETSCH and Dr. GERTRUD WILCKE. Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 4, Leipzig C 1, Germany, 1928. xii + 246 pp. 12 figures. 16 × 23.5 cm. Price, unbound, M 15; bound, M 16.

The translators have included an extensive bibliography which was not present in the English edition. The period covered is from 1887 to 1927. The first two hundred and fifty papers are of a general nature. More than five hundred references are then given, classified according to the reactions studied. An index to the bibliography lists some seventy-five reactions.

H. E. BENT

Photochemical Processes. BY GEORGE B. KISTIAKOWSKY, Research Associate in Chemistry, Princeton University. American Chemical Society Monograph Series. The Chemical Catalog Company, Inc., 419 Fourth Avenue, New York City, 1928. 270 pp. 8 figs. 15.5 × 23.5 cm. Price, $5.50.

The book is divided into six chapters with the following headings: "The Concept of Light Quanta and Photochemical Kinetics," "The Equivalence Law," "Chain Reactions," "Photosensitisation," "Catalysis and Inhibition," and "Frequency of Radiation, Temperature and the Rate of Photochemical Reactions."

The first chapter is the shortest one of the book. In it is given a brief non-mathematical discussion of some of the fundamental concepts underlying the field of photochemistry. The Grotthuss-Draper law, Fresnel's law, Lambert's law, Beers' law, light scattering and photo-kinetics are covered in rapid succession. Follow a brief discussion of light quanta and mention of the principal theories of the primary process in photochemical reactions. This chapter does not contain all of the theoretical discussion given in the book, the details being reserved for later discussion, largely in connection with specific reactions. The chapter is quite readable and clear. One might wish amplification of certain points, particularly

in the relationship of modern theories of band spectra to photochemical theory.

In the second chapter the author has limited discussion to some thirty odd reactions for which the data warrant discussion of possible mechanisms. The difficulties involved in the choice of reactions are great and probably no two photochemists could be found who would choose identical lists of reactions to be discussed. The chapter is quite readable in spite of the large amount of detail it contains and the author has usually been quite frank in stating that no definite conclusions can be drawn with regard to certain reactions. In many cases several reaction mechanisms may be used to derive equations which are equally applicable to the data. The author must, however, be lauded for his impartiality and the chapter is a good summary of the reliable data in this field.

In the third chapter a large fraction of the space is devoted to discussion of reactions involving halogens, particularly chlorine, since these reactions have been more studied than other reactions having quantum efficiencies much larger than unity. In view of the fact that the mechanisms of few, if any, of these reactions have been satisfactorily elucidated from all standpoints, one might feel that this chapter is too long in relation to the size of the book. The chapter is, however, interesting to read even if a great deal of the work included may eventually prove to be meaningless.

In the chapter on "Photosensitisation" are included discussion of gas reactions, reactions in solution and such matters as the sensitization of photographic emulsions and chemiluminescence. The author has presented the various experimental facts clearly and where possible has given discussion of reaction mechanisms. One might wish the inclusion of more of the physical aspects of the problem, since the author seems to have accepted one point of view entirely in the discussion.

The chapter on catalysis and inhibition contains a discussion of ozone decomposition, hydrogen peroxide decomposition, chlorine water decomposition, reactions of cobaltic complexes and autoxidations. The chapter is well written and the work on these reactions is quite fully given. Definite conclusions are not always arrived at, but the various aspects of the subject are presented in such a way that the reader obtains a clear idea of the field.

The final chapter contains a lot of loose odds and ends, some of which might well have been included earlier in the book. The discussion of the temperature coefficient of photochemical reactions is particularly interesting.

The style of the book is, on the whole, very good. The author has obviously not intended to give complete bibliographies for each of the reactions discussed, but has confined himself to papers permitting of some interpretation. The fact that the reading is difficult at times is not due to any fault of the author, but to the nature of the subject, since

so many self-contradictory and illogical statements are found in the literature. Some slight mistakes in literature references and in statements of the points of view of some authors have crept in, but these are not serious. One might wish a fuller theoretical discussion, but the book is a worth while summary of the work on a large number of reactions.

The reviewer takes pleasure in commending the book to anyone interested in the subject of photochemistry.

W. ALBERT NOYES, JR.

Der gegenwärtige Stand der Spannungstheorie. (The Present Status of the Strain Theory.) BY WALTER HÜCKEL. Fortschritte der Chemie, Physik und physikalischen Chemie, Band 19, Heft 4, Serie A. Gebrüder Borntraeger, W 35 Schöneberger Ufer 12a, Berlin, Germany, 1927. iv + 101 pp. 12 figs. 17 × 25.5 cm. Price, M 7.60.

In one respect the present status of the strain theory is much less satisfactory than was its status ten years ago. The facts no longer permit one to state the theory neatly and in a few words. Von Baeyer, who invented this one of the few really important theories of organic chemistry, adopted the improbable assumption that all rings are uni-planar. This made it unnecessary to contemplate the rather overwhelming possibility that the number of atoms in a cycle might be any positive integer from 2 to infinity, or that even a simple alicyclic hydrocarbon might exist in stereoisomeric forms. The fact of the existence of large rings was established by the recent but already classical work of Ruzicka, and the experimental verification of the implications of the idea of non-planar and strainless rings (Sachse-Mohr) has received important additions at the hands of Walter Hückel, who is therefore in position to discuss all of these researches authoritatively and in detail.

The last third of the book is devoted to a criticism of Ingold's hypothesis of valency angles. Von Baeyer assumed that for carbon this angle is always 109° 28′ (or that the deviation from this angle was a measure of the strain involved). The use of this improbable assumption makes possible a great many more positive predictions than its denial. Ingold not only repudiated this assumption, but he pretended to be able to calculate the manner in which substituents would affect the valency angles. He thus made the theory more explicit than before. Ingold and Thorpe defend themselves against Hückel's adverse criticism in the *Journal of the Chemical Society*, **1928,** 1318.

As a result of the industry which led to the repudiation of Von Baeyer's simplifying assumptions, chemists now have opened before them a quite endless expanse of stereo-chemical problems. Some of these are discussed very suggestively in the present volume. A further result is that the strain theory no longer constitutes a quite homogeneous and self-com-

plete chapter of organic chemistry. Such a chapter would perhaps be constituted by a complete story of the stereo-chemistry of cyclic compounds. This realm is considerably wider than the compass or intention of Hückel's brief study but it is one to which a monograph might very well be devoted.

There can be no doubt that a knowledge of the stereo-chemistry of cyclic compounds will be increasingly important to the most diverse branches of modern organic chemistry—one might mention, for example, sugars and polysaccharides and petroleum.

WALLACE H. CAROTHERS

Schiess- und Sprengstoffe. (Powder and Explosives.) BY DR. PH. NAOÚM, Director of the Research Laboratory of the Dynamite Joint Stock Company, formerly Alfred Nobel and Company. Theodor Steinkopff, Dresden and Leipzig, 1927. xi + 199 pages. 12 figs. 15.5 × 22 cm. Price, unbound, RM 12.50; bound, RM 14.

This volume is No. XVI of a series of *Technische Fortschrittsberichte*, the purpose of which is to summarize recent progress in the various branches of applied science. It has chapters on the theory of explosives, on black powder, nitroglycerine, nitrocellulose and the other nitrated carbohydrates, smokeless powder, dynamite, ammonium nitrate explosives, chlorate and perchlorate explosives, safety explosives, liquid oxygen explosives (chapter written by Dr. K. F. Meyer) and on primary explosives, primers, detonators, etc. It contains a surprisingly large amount of information and mentions or discusses many things which have not heretofore been brought together in a single book—the use of centralite in smokeless powder, the manufacture without solvent of powder containing a low percentage of nitroglycerine, non-fulminate primers containing thiocyanates, explosive superoxides, and cyclotrimethylenetrinitramine, or Hexogen as the Germans call it, which has a velocity of detonation of 8400 meters per second and is the most brisant of all explosives—to mention a few instances. As might be expected in a book of this character, there are a number of omissions. Guanidine nitrate is described but nitroguanidine does not appear to be mentioned, the preparation of trinitrobenzene by the oxidation of trinitrotoluene is not described, and no light is given on the chemistry of the sulfite, or better bisulfite, method for the purification of TNT. The statement that nitro-urea has good chemical stability is evidently an error.

The book is distinctly one for the specialist and gives an excellent account of recent progress in explosives. It will be of value to those who are concerned with that field, whether in research or in the manufacture and testing of the products.

TENNEY L. DAVIS

Creatine and Creatinine. By ANDREW HUNTER, M.A., M.B., F.R.S. Can., Professor of Biochemistry in the University of Toronto. Longmans, Green and Co., 55 Fifth Avenue, New York City, 1928. vii + 281 pp. 15.5 × 24.5 cm. Price, $5.00.

Nearly a century has elapsed since the discovery and designation of creatine in 1832 by the distinguished French chemist Chevreul. The identification of creatinine by Liebig occurred fifteen years later. These are two organic compounds widely distributed in the tissues of vertebrates, of questionable occurrence in invertebrates, but apparently present in some of the higher plants. Creatine seems to be concentrated in the muscles, which contain as much as 98% of all of the substance that is present in the vertebrate body. One or both of the compounds circulate in the blood (though the details of their occurrence there are by no means established beyond debate). Creatinine is a never-failing constituent of the urine; the appearance of creatine therein varies under conditions as yet little understood. The chemical origin, the physiological function, the abnormal occurrence and the biochemical fate of these long recognized body constituents cannot yet be presented in larger outline with any considerable degree of certainty. The problems that Professor Hunter has discussed, often with meticulous detail, still lead to a story that is full of "gaps and guesses." As Hunter himself has remarked in reviewing some of the uncertainties: "The safest position for the present is probably the admission of ignorance" (page 241).

Here, then, are themes for investigation that challenge the ingenuity of the ablest biochemists. One is not called upon to deal with tars or gums, with ill-defined products of unknown composition. The substances in question are readily crystallizable compounds of well-known structure; their biological significance is obviously notable; the need of new interpretations is pressing. Progress has been hampered, as in so many other instances, by the apparent lack of suitable methods of investigation. Progress was decidedly slow until the introduction of Folin's colorimetric methods of estimation in 1904. These are indirect and by no means devoid of pitfalls and uncertainties. New procedures seem imperative. It might be conducive to advance if much that has been published about the physiology of creatine and creatinine were temporarily forgotten so that the new students of the subject would acquire independent, unbiased starting points and impressions. In any event Professor Hunter's monograph is a *vade mecum* of inestimable value.

LAFAYETTE B. MENDEL