A the value 3873 previously found (see p. 326) from the measurements of the mutarotation of glucose in pure water at different temperatures, and for the constant of integration the value obtained from the quoted measurement of the catalysis at 30°, 0.45, the final equation being $\log_{10} B = 12.435 - 3873/T$. The values for B thus calculated on the assumption that the temperature has exactly the same accelerative action on the acid catalysis as on the mutarotation in pure water, agree well with the values that have been observed at different temperatures by independent observers, as is shown in Table IV.

TABLE IV.

Influence of Temperature on the Coefficient of the Acid Catalysis of the Mutarotation of Glucose.

Temperature.	Coefficient (B). Observed.	Calculated.	Observer.
3°	0.024	0.025	Trey[1]
14°	0.13	0.089	Lowry[2]
18°	0.13	0.13	J. Meyer[3]
20°	0.17	0.16	Levy[1]
25°	0.21	0.27	Trey[1]
25°	0.37	0.27	J. Meyer[3]
25°	0.26	0.27	Hudson[1]
30°	0.45	(0.45)	Hudson[1]

WASHINGTON, D. C.

NEW BOOKS.

Practical Physical Chemistry. By J. B. FIRTH, Assistant Lecturer and Demonstrator in Chemistry, Armstrong College, Newcastle-on-Tyne. New York: D. Van Nostrand Co., 1916. Pp. ix + 178. Price, $1.00.

This volume adds one more to the list of books on laboratory work in physical chemistry and resembles its predecessors rather closely. The following topics are treated: weighing, thermostats, density of gases liquids and vapors, surface tension, solubility, molecular weights, transition points, osmotic pressure, refractivity, polarimetry, spectrum analysis, partition coefficient, calorimetry, transport numbers, conductivity, electromotive force, velocity of reaction, quantitative electrolytic determinations, electrolytic preparations, preparation of colloids. The last three topics present the only innovations. The introduction of simple experiments on colloids is especially to be commended. The electrolytic work would be of more value if an attempt were made to bring out the fundamental principles of electrolytic processes, as is done admirably, for example, in Allmand's "Applied Electrochemistry."

The other topics are treated in conventional fashion by the apparatus

[1] *Loc. cit.*

[2] *J. Chem. Soc.*, **83**, 1321–1323 (1903).

[3] *Z. physik. Chem.*, **62**, 59–88 (1908).

and methods inherited, in common with most such manuals, from "Ostwald-Luther."

Such criticism as might be made would apply equally to other similar manuals. In order to guard the student from errors perhaps too little is left to his powers of observation and thought. He follows minute directions, observes what he is told he should see, and substitutes values obtained in formulas given. We seem not to have in any existing book a course of experiments which either calls for careful manipulation with modern apparatus on the one hand, or which prescribes experiments of a thought-provoking kind on the other hand. Perhaps our anxiety to prevent mistakes on the part of the student leads us to do all his thinking for him in the shape of formulas and minute directions.

If there is any force in this criticism, however, it applies equally to all similar books. The matter in this book is clearly presented and a copy of it should be in the hands of every instructor giving laboratory work in physical chemistry. J. H. HILDEBRAND.

Cours de Manipulations de Chimie physique. By M. CENTNERZWER, Maitre de Conferences a l'Institut Polytechnique de Riga. Paris: Gauthier Villars et Cie., 1914. Pp. vii + 182. Price, 6 fr.

The idea that has guided the author in arranging, primarily for his own classes, the material in this course has been the theoretical study of physico-chemical laws, rather than the practical manipulative experience gained from most other courses in chemistry. The ideal has been to reinforce the ideas presented in the lecture by their use in the laboratory. The author's training in the Leipzig laboratory has stamped the book, both as to ideas and apparatus, with the mark of Ostwald and his colleagues.

The chapters are as follows: properties of gases, properties of liquids, dilute solutions, chemical dynamics, thermochemistry, electrochemistry.

The intention announced in the introduction by the author is well carried out in the presentation. In addition to describing the manipulations each topic is discussed briefly from a theoretical standpoint, general conclusions being drawn where possible. The book is thus rather self-contained, and should appeal in many respects to those teaching the subject. J. H. HILDEBRAND.

A Laboratory Guide to the Study of Qualitative Analysis. Based upon the application of the theory of electrolytic dissociation and the law of mass action. By E. H. S. BAILEY, Ph.D., Professor of Chemistry in the University of Kansas and HAMILTON P. CADY, Ph.D., Professor of Chemistry in the University of Kansas. Eighth edition. Revised by Paul V. Faragher, Ph.D., Assistant Professor of Chemistry in the University of Kansas, in collaboration with the authors. P. Blakiston's Son and Co., Philadelphia. Pp. x + 294. Price, $1.50.

About 130 pages are left blank for use by the student in entering his notes and writing reactions. In some instances a few reactions or suggestions are printed on these note pages.

The authors of this book are consistent throughout in adhering to their plan of presenting qualitative analysis from the standpoint of the theory of electrolytic dissociation and the law of mass action. The various elements and radicals are always referred to as ions and in many cases the mass action law equations are given. In the systematic classification the alkalies are called Group I, so that simple reactions may be studied first and, as stated by the authors, so that the book can be used to better advantage as an accompaniment to a course in the general chemistry of the metals. The characteristic reactions or tests of all the ions are given first and the tabulated, systematic separations and directions for the analysis of unknowns are placed at the end of the book.

The selection of tests and separations is good and the directions are clear and concise. The reviewer notes with pleasure the treatment of oxidation and reduction and the inclusion of the method for balancing oxidation-reduction reactions. The physicochemical explanations are so used that on reading the book the impression left is that it is a work on qualitative analysis in which the phraseology of electrolytic dissociation and of mass action is used and not that it is an elementary treatise on physical chemistry illustrated by experimental qualitative analysis.

C. W. FOULK.

A Laboratory and Class-Room Guide to Qualitative Chemical Analysis. By GEORGE F. WHITE, Ph.D., Assistant Professor of Chemistry in Clark College, Instructor, Clark University. Pp. v + 171. D. Van Nostrand Co., N. Y. Price, $1.25.

Those teachers who want a small book full of physicochemical explanations should look into this one for in its 170 pages is condensed a surprisingly large amount of general chemistry along with the usual tests and separations of qualitative analysis. The first twenty-three pages are on "Theories of Aqueous Solutions" beginning with Boyle's law and ending with the electron theory and its application to electrolytic dissociation. Then follow the typical reactions of each of the common elements and ions and the systematic examination of mixtures. The physical chemistry is not confined to the first few pages but is used throughout the book. Many reactions are given both in the ionic and molecular forms. The tests and separations are good, clearly expressed and up-to-date. Oxidation and reduction are presented, as they should be, as a gain or loss in valence and not as a gain or loss of oxygen. It is a pity, however, that the simple method of balancing oxidation-reduction reactions was not included.

The English of the book is somewhat unsystematic; the short numbered paragraphs under "reactions" being given hit or miss in the imperative or indicative mode and sometimes both ways in the same paragraph, as for example, No. 3 on page 47, which reads: "KOH precipitates $Bi(OH)_3$. Add bromine and heat."

The reviewer is of the opinion that the book would have to be handled with great care in the teaching. There is so much general chemistry in it that students might lose the main issue and fail to learn how to make qualitative analyses. However, there is a difference of opinion on this point. Some teachers, like Dr. White, look on qualitative analysis as a means of teaching general chemistry; others look on general chemistry as a means of explaining qualitative analysis. The former will be delighted with this book and the latter, with care, will be able to use it.

C. W. FOULK.

Experimental Organic Chemistry. By JAMES F. NORRIS. International Chemical Series. McGraw-Hill Book Co., Inc., New York. Price, $1.25.

It is quite obvious to one who has studied the curricula of the various institutions offering organic chemistry that three distinct texts are desirable, namely, a short course for those students who desire only the briefest outline of the subject with or without laboratory preparation work; a medium course covering the subject more completely including some laboratory preparation, and finally an extended course covering the general principles of organic chemistry and supplemented by extended laboratory work.

The above general statement concerning text books applies equally well to laboratory manuals. A glance at the manual under discussion from the above points of view will indicate that it belongs to the medium class, although it might, on account of its logical arrangement, be used successfully in a briefer course.

As indicated by the title of the book, its object is more than that of a simple manual of organic preparations. A fairly large amount of space is given to the study of the physical and chemical properties and tests for the substances in hand whether they were actually prepared by the student or not. On reading the book one is inclined to draw the conclusion that, while the methods employed and the quantitative results of the experiments are emphasized, the important part of the experiment is the experience gained by the student through a study of the general properties of the preparations together with their chemical tests. This inference may also be drawn from the preface of the book in which reference is made to that excellent work of S. P. Mulliken, "The Identification of Pure Organic Compounds." While it is true that too much importance can scarcely be attached to this kind of work, it is likewise true that there is danger of making tests of this kind overshadow exact preparation work which in reality constitutes the most important part of any course in organic preparations.

The first forty pages of the book are given to a concise discussion of laboratory methods. This excellent introduction is supplemented by sufficient cuts to fully illustrate the work. Then follows a discussion of

the aliphatic compounds such as is found in the average manual except as indicated above that considerable space is given to physical constants and tests. The remainder of the book is devoted to the aromatic series with the exception of the last three chapters which cover the heterocyclic compound, including the alkaloids, the proteins, the identification of organic compounds and a two-page appendix. The aromatic preparations are well selected. The same emphasis, however, is placed on the physical constants and tests which is apparent in the study of the aliphatic compounds, although the vital importance of quantitative yields is not forgotten. The last three chapters are very condensed, the heterocyclic chapter so much so that it is questionable whether it would have detracted from the book to have omitted it altogether.

On the whole the book is a distinct acquisition to the list of organic manuals and will certainly find a place in many organic laboratories, especially where medium courses are offered. GEO. B. FRANKFORTER.