NEW BOOKS.

Color in Relation to Chemical Constitution. By E. R. WATSON. Longmans, Green & Co. New York: 1918. xii + 197 pp., 14 × 23 cm. $4.00. (This is one of the series of monographs on industrial chemistry edited by Sir Edward Thorpe.)

The object of the book is to give a simple and connected account of the main lines of which research and discussion have taken place with regard to the relation between color and chemical constitution, and of the main theories which have been proposed as to the nature of the vibrations to which ordinary color is due. The quinonoid theory and Nietski's rule have both proved valuable working hypotheses in aiding the production of new dyes; but neither one is really adequate. We have to choose at present between theories that are admittedly incomplete and a theory like Baly's which is so vague that it has very little value, because it will account for an absorption band in any position whatever for any substance (p. 146). "As a matter of fact any particular substance exhibits a very limited number of absorption bands under any particular conditions, and we want to be able to calculate the positions of these bands from the constitutional formula of the substance. Baly would say, for example, that ths shade of dyeing obtained with alizarin on alum mordant corresponds to a particular stage in the opening up of the force-field of alizarin, and this corresponds to the 29th multiple of a fundamental frequency of 67.5. It is possible that the fundamental frequency of 67.5 might be referred to some radical in the alizarin molecule; but there is no explanation whatever as to why this particular infra-red vibration, rather than any of the others executed by alizarin, should be *the* one to give harmonics or overtones. Still less is there any explanation as to why the 29th multiple should be called up when the alizarin is fixed on alum mordant."

The general presentation of the theories is good and the book is a storehouse of facts. Since flame colors are mentioned, the reviewer would have liked to see a reference to the work from his laboratory on copper salts. The subject is presented under the following headings: early history of the subject; discussion and modifications of the quinonoid theory; absorption spectra and the methods of examining and recording them; absorption spectra of typical organic substances and dyestuffs; relationships between constitution and depth of color; theories on the nature of the vibrations causing absorption bands and color; infra-red absorption spectra of organic substances; fluorescence; the color and spectra of inorganic compounds; bibliography. It is a useful book.

WILDER D. BANCROFT.

James Woodhouse, a Pioneer in Chemistry. By EDGAR F. SMITH, Provost of the University of Pennsylvania. The John C. Winston Company, 1918. 299 pages.

This is the second biographical volume from Dr. Smith's pen since the

publication of his "Chemistry in America" in 1914—the first being the rather sumptuous Life of Robert Hare. This life of Woodhouse is of more modest dress, but attractively printed in large type.

Dr. Smith's enthusiasm for the earliest manifestations of interest and activity in chemistry in this country is well known, and comment on the over-emphasis into which this sometimes leads him unnecessary.

Woodhouse was born in Philadelphia in 1770, was graduated from the University of Pennsylvania in 1787, in the Medical School came under the influence of Dr. Rush, became increasingly interested in chemistry, and in 1795 was elected to the professorship of chemistry in the University of Pennsylvania—a position that had just been declined by Joseph Priestley. He died in 1809 after 14 years of active service. "He entered upon this career with meager preparation and equipment, judged by present-day standards, but by steadfast application he gradually grew in power, until his keenest critics were quite ready to acknowledge him as leader and defer to him all questions pertaining to chemistry. Let the American field be viewed from any standpoint, and there appears as the outstanding chemical figure for a decade more or less in that now far-away period, but one person—*James Woodhouse*, a genuine pioneer in establishing correct ideas of combustion, respiration, and also the composition and decomposition of water. In short, Woodhouse, placed this country in sympathy with those European lands which, but a little earlier, had attached themselves to the French standard."

"Woodhouse was further, a pioneer in" plant chemistry; the isolation of at least one metal from its hydroxide (potassium); laboratory esperimentation; chemical analysis; elaboration of industrial chemical processes; chemical research. For details of these claims see the text.

This volume is a useful addition to the history of American Chemistry.

JOHN T. STODDARD.

SMITH COLLEGE, NORTHAMPTON, MASS.

Graphical and Mechanical Computation. By JOSEPH LIPKA, Ph.D. John Wiley and Sons, Inc., New York, 1918. viii + 364 pages. 14 × 23½ cm., 205 figures, 2 charts, cloth, $4.00.

This valuable book possesses a decided interest for the chemist, at least for the chemist who has much computation to perform, either of a routine nature, or in the interpretation of his results.

The first chapter is devoted to a discussion of scales and of slide rules, both of the conventional logarithmic type, and of special types for the solution of particular problems. Several chapters then deal with methods for the graphical representation of numerical data and for the graphical solution of algebraic expressions. The use of the ordinary cartesian systems and of logarithmic coördinates for these purposes is carefully explained. In addition, and of more importance because of its novelty,

several chapters are devoted to the study of nomographic projection. This subject, certainly but little known to the average chemist, makes possible by the construction of a simple group of three straight lines on which appropriate scales are laid off, a quick and relatively accurate solution of algebraic formulas, even when these are quite complicated and include more than three independent variables.

There are two valuable chapters devoted to the derivation of empirical formulas to represent numerical data. Under this head, the methods of Selected Points, of Averages, and of Least Squares are discussed clearly and fully, and applied to a great number of representative examples. In these chapters particularly the author has achieved the almost unique distinction of presenting the subject from the point of view of the student who wishes to *use* the information rather than as an illustration of mathematical theory. He also displays a rare appreciation of the concept of significant accuracy and of the value of time.

There are useful final chapters on graphical interpolation and on approximate integration and differentiation.

This book, with its clarity of presentation, its thorough good sense, its wealth of carefully prepared charts and of illustrative examples, represents a real achievement in this field. ARTHUR B. LAMB.