

results might be conserved in a book of equal size, provided ordinary quantitative physical and chemical data (which students cannot remember) were tabulated, and the space thus saved devoted to discussions of the rationale of essentials.

The quotation that follows has been selected at random, and fairly represents the general character of the statements. We find only this in explanation of cupels and cupellation: "cupels are small articles made of bone-ash and used in the process of cupellation. Bone-ash absorbs the oxides of almost all metals, particularly those of lead, hence it is used in purifying gold and silver, which do not oxidize." G. H. MEEKER.

A TREATISE ON PHOTOGRAPHIC OPTICS. BY R. S. COLE, M.A., Late Scholar of Emmanuel College, Cambridge; Assistant Master, Marlborough College. Illustrated. New York: D. Van Nostrand Co. 1899. 330 pages. Price \$2.50.

This is a modern book covering in a very satisfactory manner the important principles of optics as applied in photography. The matter is divided into seven chapters treating of the General Theory of Light; Elementary Theory of Lenses; Aberration; Correction of Aberration and the Design of Lenses; Lens Testing; Exposures, Stops, and Shutters; Enlargement, Reduction, Depth of Focus, and Halation. As far as is possible, consistent with thoroughness, the discussion is carried on with the aid of very elementary mathematics only, the formulas and equations introduced corresponding to about what is found in our usual college courses in physics.

The chemistry of photography is not touched upon at all but in other directions the book contains much practical information, especially useful to the investigator or to the manufacturer of photographic apparatus rather than to the every-day commercial photographer. The scientifically inclined amateur who desires to get the best results from the appliances at his command or who wishes to improve understandingly on what he has, will find in this book much of the needed help. For example, the chapter on exposures, stops, and shutters explains, in a very concise way, the principles which should guide in the construction of shutters, and their action and efficiency in very short exposures and gives results which the student might otherwise have to search through many volumes of journals and annuals to find.

What is given on enlargement and reduction takes up practical details more fully than is true of other parts of the book and appears to be well-written and useful. On the whole the work can be heartily recommended to the class for which it is written.

J. H. LONG.

ANLEITUNG ZUR DARSTELLUNG CHEMISCHER PRAPARATE. Ein Leitfaden für den praktischen Unterricht in der anorganischen Chemie. VON PROFESSOR DR. H. ERDMANN in Halle. Zweite Auflage, mit 15 Abbildungen im Text. Frankfurt a. M.: H. Bechhold. 1899. viii + 92 pp.

The first edition of this book has won for itself a wide-spread reputation as a text-book for the preparation of chemical compounds. Dr. Erdmann is an exception to the general rule of German chemists. He is a firm believer in the supremacy of inorganic chemistry, and the methods he has introduced in the study of this subject will be acknowledged by most teachers as a progressive step. The author carefully points out in his preface to this edition that previous to the appearance of his book very little time was devoted in laboratory instruction in the preparation of inorganic compounds. Although it has always been recognized that the study of organic chemistry is best carried out by the preparation of a number of typical compounds, yet the experimental study of inorganic chemistry has mostly been limited to test-tube reactions. Dr. Erdmann has been a very active factor in changing this point of view, and the chemists of the inorganic schools both here and in Germany are requiring a more and more thorough drill in chemical preparations. Such a method brings out the manipulative skill and causes the student to exercise his experimental ingenuity more than any other thing in the study of chemistry. If students were required to make their chemicals on a scale sufficiently large for practical use, the majority of them would be better chemists. And it is not in the preparation of fanciful chemicals that the best education is obtained, but in the making and purification of the common substances which are met with every day. Another point which the author insists upon is the use of raw materials in sufficient quantity to give the student a good idea of the comparative amounts of final products obtained in each case; and this is a point which should not be overlooked, for production is a very essential factor in such a course. A