

inventions. The cases of the thermometer and of the electric telegraph will occur to every one. In many cases the conflict for priority is due to the fact that similar thoughts occur independently to more than one person, and oftentimes an invention is a growth to which several individuals have contributed. Few philosophical instruments are perfect at their birth, the barometer being a notable exception.

Professor Cajori's book can be recommended to students who really want to master the historical aspects of physical science.

H. CARRINGTON BOLTON.

CHEMISTRY AND METALLURGY APPLIED TO DENTISTRY. BY VERNON J. HALL, PH.D., Professor of Chemistry and Director of the Chemical Laboratories in the Dental School and in the Woman's Medical School of Northwestern University. xii + 246 pp. Evanston, Ill.: The Technical Press. 1898.

There are, probably, many members of the American Chemical Society who will have but a vague idea as to the precise field which this book is designed to fill. For the benefit of such members, it may be said that the book is but one recognition of a general change in methods of instruction now actively progressing in dental schools; namely, the introduction of really meritorious courses in the sciences of pathology, anatomy, physiology, and chemistry, as necessary adjuncts to the purely practical courses in operative dentistry and dental prosthesis.

The metal work of dentistry being of such eminent practical importance to the profession, it naturally follows that metallurgy is that department of chemical teaching which is most emphasized in dental schools. Hence a demand for specialized textbooks on "dental metallurgy."

We do not think that the book before us is destined to take any prominent place in the development outlined above; unless, perhaps, as an adjunct to Professor Hall's lectures. Its laying out of a systematic laboratory course on the physical properties of metals is timely and meritorious; as is also the practice in the refining of certain metals. The work is decidedly weak, however, in two points: it is replete with partial truths, which are almost unavoidably uninformative or misleading; and it barely touches upon the philosophy of the subject-matter. It therefore fails as a compilation, or as an index to progress—both of which

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.