NEW BOOKS.

A Course in Qualitative Chemical Analysis of Inorganic Substances, with Explanatory Notes. By OLIN FREEMAN TOWER, PH.D., Hurlbut Professor of Chemistry in Adelbert College of Western Reserve University. Philadelphia: 1909. P. Blakiston's Sons and Co. pp. xi + 83. Price, $1.00 net.

The volume is designed to "appeal to those teachers who wish a concise treatise along modern lines, which will encourage the student not only to carry out accurately the mechanical processes of qualitative analysis, but also to apply some of the principles of modern chemistry in his practical work." To this end, an introduction including the more important applications of the ionic hypothesis to the phenomena of solution, precipitation, hydrolysis and solution tension, precedes the directions for analysis. The plan adopted for the presentation of the latter is essentially that of A. A. Noyes, in which the explanatory notes follow the working directions, allowing the latter to be easily understood. The methods selected are standard ones, and include some recently proposed, as that of Noyes and Bray for the separation of antimony from tin. Alternative methods for the separation of the iron-zinc group are included, and procedures for the detection of the acid radicals, for "dry tests," and the preparation of solutions for analysis are carefully worked out. The appendix contains tables of strength of reagents in grams and in relation to a normal solution, directions for the preparation of certain reagents, and a table showing the percentage dissociation of a variety of electrolytes.

The book is one which will commend itself heartily to thoughtful teachers, and, while its best features have plainly been modeled after existing publications, they have been combined to form one of the most useful manuals recently published.

The book is marred by the full page of errata which confront the reader at the start, and reading is made difficult by the use of almost invisible dots to indicate the charges upon the cations throughout the book.

H. P. TALBOT.

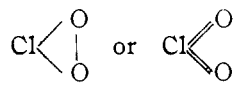
The Theory of Valency. By J. N. FRIEND. London and New York: Longmans, Green & Co. xiv + 180 pp. Price, $1.60 net.

This volume belongs to the series of Text-books of Physical Chemistry, edited by Sir William Ramsay. It opens with two chapters on the history of valency. A chapter on the theory of valency and two chapters on valency and the periodic law follow. After two chapters on the valency of carbon, there are ten chapters on the valencies of the elements. The book closes with three chapters on Werner's theory, on the electrochemical theories of Davy, J. J. Thompson, Abegg, Ramsay, and Friend, and on Pope and Barlow's theory.

The opening and closing chapters on the history and the various theories

of valency are brief but adequate. The intervening chapters are decidedly feeble. For example, the behavior of thallic iodide, both as $Tl^{III}I_3$ and as $Tl^{I}I$, I_2, and other facts showing that a compound of the form of TlX_3 does not necessarily contain trivalent thallium, are stated. But just above, the compound $TlCl_3 2H_2O$ is mentioned, and the comment is: "Here the thallium is clearly trivalent, unles indeed we assume that the water of crystallization is directly attached to the metal, when still higher valency must be attributed to it. This is scarcely likely to be the case, however, as thallic nitrate" has the formula $Tl(NO_3)_3,8H_2O$. How could the formula alone ettle the case of $TlCl_3$ "clearly," when the formula TlI_3 (considered apart from the chemical behavior) would not? And again, do we count the water of crystallization in estimating valency when it does not give too high a number, and omit it when it does? When, if ever, do we count in the water of crystallization? The author stirs up these questions quite needlessly and, having thus befogged the reader a little, goes on to something else.

The whole treatment of chlorine dioxide is as follows: 'In chlorine peroxide we may have either divalent or tetravalent chlorine, thus:



The former scheme illustrates the peroxide properties of the molecule better than the latter." Of course we may have almost any valency—on paper: the experience with the hydrates of thallic compounds shows that. But what is the meaning of the second statement about chlorine dioxide, and what is the value of the first? Two pages later (p. 114), we get the solution of the former question, as it were by accident. "Iodoxybenzene .....$C_6H_5IO_2$..... behaves like a peroxide. On heating to about 227° it explodes." Is nitrogen pentoxide a peroxide, then, because it explodes, and sodium peroxide not? Just above (p. 111), we read: "Chlorine is uniformly monovalent in its hydride, for hydrogen chloride shows no tendency to associate to double molecules..... Mellor has obtained evidence of the existence of HCl_3, which may be regarded as

....."

The central chapters contain many rambling statements and illogical passages of this description. The general impression left by reading these chapters is that, when valency is not perfectly definite, it is a matter of speculation, and that one guess is little better than another.

There are many omissions. The stock valence-puzzles, Pb_3O_4, Fe_3O_4 and Mn_3O_4, are omitted, although they would have been more instructive than many that are mentioned. The statement of Orme Masson's

reasons for placing hydrogen at the top of the halogen column of the periodic table (p. 28) omits the most cogent of all—the interchangeability of chlorine and hydrogen in hydrocarbons and hydrocarbon radicals. The conception that sodium is trivalent in H—Na=O, attributed to Wanklyn (p. 59), was urged two years earlier (1867) by Wolcott Gibbs. Whenever a chlorine compound presents difficulty, the presence of the group —Cl=Cl—, or $(Cl_2)^{II}$, is suggested (*e. g.*, pp. 58, 61, 64, 67, 111). But the origin of this idea, in which the author frequently takes refuge, is nowhere given. Its use, first by Naquet (1867) for K—$(Cl)_2$—Ag, and later, on an extensive scale, by Blomstrand and Remsen, and later still by Armstrong (1885) and others is nowhere mentioned. In this connection, the conclusion of more than a page about calomel may be noted: "It is not improbable" that the formula is Hg—Cl=Cl—Hg. If the work of Ogg and others, showing that mercury salts in solution give the ion Hg_2^{II}, had not been overlooked, an equally vague vote for the alternative formula Cl—Hg=Hg—Cl would probably have been substituted for that actually cast by the author.

In the absence of other recent works on the subject the book may prove interesting to advanced students, but critical reading is required to sift the chaff from the wheat. ALEXANDER SMITH.

Antimony. Its History, Chemistry, Mineralogy, Geology, Metallurgy, Uses, Preparations, Analysis, Production, and Valuation, with Complete Bibliographies. By CHUNG YU WANG, M.A., B.Sc., Mining Engineer and Consulting Geologist. Philadelphia: J. B. Lippincott Company; London: Charles Griffin & Company, Limited. 1909. pp. 2 + 217, illustrated. Price, $4.00 net.

"A metallurgical work in English by a Chinese author is unusual," indeed. More books of this character are desirable, whoever may be the authors or whatever may be their nationalities. The book is marred by a few China-isms (perhaps, the reviewer does not know Chinese), but they simply lend color to the quite complete summation of the knowledge of antimony along with the presentation of much that is novel.

The work is arranged in the most orderly and systematic manner, as one would anticipate, when he notes that it is dedicated to Prof. J. F. Kemp, "under whose guidance the author has learned the value and method of scientific research." One illustration of the completeness of the work will suffice. Seventy-nine pages are given to the metallurgy of the element. These contain a bibliography of 197 references, including the patents of the United States, England, Germany, France, and Belgium. A digest of the causes for the variations in the prices of antimony are given and the volume closes with lists of the principal mines and smelting works of the metal.

In closing the review of this book, a copy of which should be in every library of chemistry, two thoughts of general significance come to the