teen schools have a full four-year high-school course in agriculture and will therefore receive $500 each in accordance with Article 22, Education Law of 1910. In addition to these special vocational courses in established high schools twenty-three high schools give some instruction in agriculture.

L. S. Hawkins

Cortland, N. Y.

SCIENTIFIC BOOKS

The Absorption Spectra of Solutions of Comparatively Rare Salts Including those of Gadolinium, Dysprosium and Samarium, the Spectrophotography of Certain Chemical Reactions and the Effect of High Temperature on the Absorption Spectra of Non-aqueous Solutions. By Harry C. Jones and W. W. Strong. Publication No. 160 of the Carnegie Institution of Washington.

In this monograph the authors present the results of their recent spectrochemical investigations carried out along the three following distinct lines: (1) The mapping of the absorption spectra of certain comparatively rare substances, (2) the spectrophotography of some oxidation reactions, and (3) the effect of relatively high temperatures on the absorption spectra of alcoholic solutions.

In an introductory chapter a brief review is given of some important spectrochemical investigations of the last decade concerning the nature of the emission and absorption centers of light; the connection between these centers and molecular and atomic structures; the effect of ionization and recombination on these centers, and the effects that can be produced by physical and chemical agents upon the constitution of the emission and absorption centers.

The general method of experiment was similar to that employed by Jones and his coworkers in their previous investigations. For experiments at high temperatures a new form of absorption cell was devised, for a description of which the original monograph must be consulted. Through the kindness of Professor Urbain sufficient quantities of the oxides of samarium, dysprosium and gadolinium were loaned the authors to enable them to prepare the various salts whose solutions they wished to study.

An examination of the spectrograms in this and the preceding monographs shows that in general the absorption spectra of various salts of the same element are very similar. With high dispersion the minute structure of the bands and groups of bands is shown to be very different for different salts of the same element, this being especially true of the salts of neodymium. Beers's law has been shown to hold approximately for nearly all solutions of a single neutral salt in a single solvent. Each solvent is characterized by a definite absorption spectrum, and when a salt is dissolved in a mixture of varying proportions of two solvents only two definite absorption spectra appear, a result which the authors interpret as an indication of the formation of definite compounds of solvent and solute or "solvates."

In their study of oxidation phenomena uranous salts were subjected to the action of both weak and strong oxidizing agents, the salts being dissolved in single and mixed solvents. On dissolving uranous chloride in a mixture of alcohol and water, the bands characteristic of both solvents appear simultaneously. A mild oxidizing agent was found to oxidize the "hydrated" salts and leave the "alcoholated" salts unchanged, while with a strong oxidizing agent both "hydrated" and "alcoholated" salts were oxidized to the uranyl condition.

Rise of temperature has been shown to cause a widening of the bands in solutions of a pure salt in a single solvent, the edges of the bands becoming hazy. When several salts are dissolved in the same solvent the bands become weaker as the temperature rises. In general the center of intensity of the single bands remains unaltered with rise in temperature.

This recent publication of Jones and his associates is another valuable contribution to the literature of spectrochemistry and will undoubtedly find a place on the book-shelves of those engaged in spectroscopic investigations. No little credit is due the printer for the ex-

cellence of his work, without which the plates would be of much less value.

FREDERICK H. GETMAN

Historical Papers on Modern Explosives. By GEORGE W. MACDONALD. Whittaker & Co., N. Y. 1912. Pp. 192. $2.50 net.

When the age of the world as fixed by the most recent observers, such as Becker and Clarke, the probable length of time it has been inhabited by man, and the important part which chemistry played, both in the creation of the earth and of its inhabitants, is considered, it is an amazing thing that man was so very slow in assembling a systematized knowledge of chemistry and especially slow in recognizing those compounds which are reservoirs of energy, for though compounds of this kind, such as the nitrosubstitution compound, picric acid, discovered by Hausmann in 1788, were described in the latter part of the eighteenth century, it was not until the opening year of the nineteenth century, in which Howard discovered mercuric fulminate and demonstrated its properties, that man apparently began to realize that energy could be stored up in individual compound molecules which was ready for release at command, so that it might be employed like the bent bow, the coiled spring, the head of water, the wind, or the energy of man or animals applied through the many mechanical devices then invented, or mixtures of substances, such as gunpowders, to do work.

This new conception of a capacity with which compound molecules might be endowed was, in the middle of the nineteenth century, reinforced by Schönbein's discovery of cellulose nitrates and Sobrero's discovery of glyceryl nitrates; and the discovery and recognition of the value of molecules so constituted to mankind in the accomplishment of work has gone on with continued acceleration ever since, for masses of the mercuric fulminate, cellulose nitrates, glyceryl nitrates, alone or compounded into mixtures such as the many dynamites, smokeless powders and permissible explosives, have been put to do work in engineering projects and in military operations, and they have, when wisely used, materially increased the resources of man in his contest with the material world in which he is placed and environed.

The period covered by MacDonald in the book under review is from 1800 to 1887 and it deals with the discovery and development of the three explosives last enumerated. This was a period of marked scientific and technical activity with regards to these bodies and much was published regarding them in widely scattered publications, some of which are now difficult of access, and because of this, and further because the earliest literature "often contains observations and experiments which are generally considered to be the results of much later investigation" the author has brought them together here after having published them as separate articles in *Arms and Explosives.*

Mr. MacDonald has not given reprints but rather condensed résumés in which he has divided single articles into several smaller ones and introduced comments of his own. Further he has drawn his material from patent literature and unpublished correspondence as well as from scientific journals, and recast or "reduced tabulated results to statements of fact." It will be seen therefore that the book is not authoritative, even to the extent that carefully supervised reprints would be, and that its usefulness is limited.

There appears a lack of proportion in the treatment since 149 out of the 192 pages are devoted to gun cotton and 98 of these to Abel's work leaving Schönbein the discoverer, and von Lenk, whose pioneer work in Austria was presented freely and in detail to the Committee of the British Association, quite in the background. In fact there is a distinctly British tendency permeating the book.

CHARLES E. MUNROE

Insect Pests of the Farm, Garden and Orchard. By E. DWIGHT SANDERSON. New York, John Wiley & Sons. 1912. $3.00.

The author explains in the preface how his attempt to revise his former book "Insects Injurious to Staple Crops" finally resulted in