resulting from the interference of the direct wave train with the train reflected from the back surface of the film. In other words, the colors of the photochromes were similar to the colors of the soap-bubble. This is precisely the principle since made use of by Lippman in his beautiful process.

Zenker's book opens with a short elementary account of the nature of light, of no especial interest. Following this comes a very complete account of the work of Seebeck, Becquerel, Poitevin and others. His account of the claims of Hill, the American photographer, are interesting, final judgment of the case being left to the reader.

Full details are given in most cases of the method of preparing the plates, and the reader will find himself strongly tempted to repeat some of these early experiments.

The third portion of the book treats of the theory of photochromy. The colors of the photochromes had been explained in various ways. Some held that colored oxidation and reduction products were formed while others assumed that the chemical action of the light occurring at the surface, formed a film of varying thickness which showed color precisely like the film of a soap bubble. Zenker effectually demolishes this theory by showing that prolonged exposure, by increasing the thickness of the film, should change the color, which is not the case.

He then advances his own beautiful theory, not abandoning the soap film idea, but presenting it in a wholly new light. He conceives the light waves as penetrating the film and suffering reflection at the back surface. The reflected waves interfere with the oncoming waves forming a stationary system, the ether within the film vibrating in nodes, like the string of a musical instrument when sounding a harmonic. He shows us that there will be planes of vibration within the film parallel to the reflecting surface situated half a wave-length apart. In other words the distance between the planes of maximum vibration will depend on the wave-length or color of the light. If the silver is reduced in these planes and not at the nodes (when there is no vibration) we shall have reflecting laminæ formed, which will act like the upper and lower surface of a soap film and show interference colors. The light most copiously reflected under these conditions will be of a color identical with that of the light which formed the laminæ. He describes a number of experiments confirming his theory, but pushes it too far in attempting to explain the color of ordinary objects and the perception of color by the eye in this way.

His book is on the whole a most excellent résumé of the work done up to the time of its publication.

The appendix, in which the further development of the subject is treated by E. Tonn, deals chiefly with matters of theoretical interest. The work of Wiener and Lippmann is discussed in connection with the theory of the reproduction of mixed colors. As a matter of fact there have been very few or no developments since the time of Zenker, except along the lines indicated by Lippmann, and as no details of this process are given, the appendix is likely to be of interest to the physicist rather than to the photographer.

R. W. Wood.

BOOKS RECEIVED.

Grundlinien der anorganischen Chemie. Wilhelm Ostwald. Leipzig, W. Engelmann. 1900. Pp. xix + 795. 18 Marks.

Der Gesang der Vögel. Valentin Häcker. Jena, Gustav Fischer. 1900. Pp. vii + 102. 3 Marks.

Symons's British Rainfall, 1899. Compiled by H. Sowerby Wallis. London, Edward Stanford. 1900. Pp. 251. 10s.

Foundations of Knowledge. Alexander Thomas Ormond. London and New York, The Macmillan Co. 1900. Pp. xxvii + 528.

SOCIETIES AND ACADEMIES.

NEW YORK ACADEMY OF SCIENCES.

SECTION OF GEOLOGY AND MINERALOGY.

At the meeting on May 21st, Dr. A. A. Julien presided and about twenty persons were present. Two papers on the rocks of Mexico were presented. The first was by Mr. G. I. Finlay, entitled 'A New Occurrence of Nephaline Syenite and associated Dikes in the State of Tamaulipas, Mexico, with a review of the distribution of these rocks in North America.' The second paper was a 'Contribution to the

Geology of Part of Sonora, Mexico,' by Mr. B. F. Hill. Both gentlemen are post-graduate students of Columbia University.

The rocks described by Mr. Finlay were sent by Mr. E. D. Self to Professor J. F. Kemp. The nephaline syenite is a very light-colored rock, containing, besides abundant nephaline and an orthoclase, small patches of dark-colored silicates. Under the microscope these are seen to be ægerine augite intergrown with hornblende, and accompanied by magnetite and apatite. Titanite is abundant, with the faces (1–2–3) well developed, and some zircon occurs. The tinguaite associated with this syenite is a holocrystalline porphyritic dike rock, with large phenocrysts of orthoclase, twinned on the Carlsbad law, tabular in habit, parallel to the clinopinacoid. The ground mass which gives the rock an even, dark green color, consists of a felt of tiny blades of ægerine and orthoclase. The ægerines are at times grouped together in bundles around small patches of biotite.

Mr. Finlay then briefly discussed the distribution of similar rocks in the various portions of the United States, and exhibited a very instructive series of comparative charts of the chemical composition of the rocks examined and those of allied groups, the charts being constructed on the principles of the graphic method devised by Professor Hobbs, as worked out by Mr. Finlay.

The second paper, that of Mr. Hill, also treated of Mexican rocks, and the same geographical maps were employed to illustrate both papers. Little has been written about the coal-bearing rocks and their associated eruptives in the state of Senora, Mexico. The work done by Professor Dumble and his associates has thrown considerable light on some of the problems.

In the district investigated are representatives of nearly all the formations from the Archæan granites to the Quarternary sands and gravels. The most important division, however, is the Triassic. The slates, sandstones, quartzites, etc., with coal seams, make up the lower or Bananca division of the Triassic, while an immense series of associated eruptives, including andesites, dacites, tuffs, andesitic, conglomerates, etc., is considered the upper division. To the series of eruptives the name of Lista Blanca has been given. The Lista Blanca has hitherto been considered post-Cretaceous.

In addition to the pre-Cretaceous eruptives, there are numerous intrusives and flows of diorites, rhyolate, and basalt, and in one instance, trachite. It is probable that these are mostly of Tertiary age. The diorites exert a very noticeable effect on the formation of the ore bodies of the region.

Specimens of all the eruptives were brought to New York and studied by Mr. Hill, in thin section, under the microscope. A series of chemical analyses of the type rocks was made and a very clear relation established between the magmas of the different flows. The remainder of the paper dealt with details on the petrographic characteristics of the rocks.

Both papers were discussed by Professor Stevenson, Professor Kemp, Dr. Julien and Dr. White.

THEODORE G. WHITE,
Secretary of Section.

DISCUSSION AND CORRESPONDENCE.

MR. TESLA AND THE UNIVERSE—HUMAN ENERGY AND HOW TO INCREASE IT—HIS PHILOSOPHIZING QUESTIONED.

MR. NIKOLA TESLA has written a long article in the *Century Magazine* for June with the title 'The problem of increasing human energy, with special reference to harnessing the sun's energy.' The paper is profusely illustrated with impressive cuts of electrical experiments which, at first sight, seem convincing. Most readers of the *Century* looked at the striking cuts and glanced at some of the head lines of the article such as 'Development of New Principle'; 'Production of Immense Electrical Movements'; 'The Earth responds to Man'; Interplanetary Communication now probable,' and accepted the headlines on the testimony of the cuts; or else took it frankly for granted that so long an article must certainly prove a great deal.

The present writer has lately gone over the text of the article, pen in hand, and herewith