chloride and copper bromide in methyl and ethyl alcohol and in acetone are also studied. Photographic records showing the absorption bands in the different solutions are presented. These photographs show admirably how the absorption bands gradually change as the various dehydrating agents mentioned are added to the solutions. In the discussion of the results the difficulties met in interpreting spectroscopic observations of this kind are clearly set forth. In fact the second part of the monograph is more carefully and judiciously written than the first part, the latter containing practically no reference to the experimental work of others, whereas in the second part the work and opinions of other investigators receive due consideration. Attempts to deduce the approximate quantitative composition of the hydrates in solution from the study of the absorption spectra are, of course, not made, for such observations do not lend themselves for that purpose. It is simply claimed that the results bear out Jones's ideas of hydrates in solution in a satisfactory manner.

Louis Kahlenberg
University of Wisconsin,
May 10, 1907

Electrons or the Nature and Properties of Negative Electricity. By Sir Oliver Lodge. London, George Bell and Sons. 1906. Pp. xvi + 230.

Up to the time of the publication of Maxwell's 'Treatise on Electricity and Magnetism' in 1873, in which the ideas of Faraday were subjected to mathematical analysis, and greatly extended, the preponderating rôle which the luminiferous ether plays in electrodynamic phenomena had been almost entirely overlooked by theoretical physicists. Attention had been concentrated upon electrical charges and currents, and the influence of the medium which transmits electric and magnetic forces was quite neglected. The steady progress of Maxwell's theory, its evident superiority to its older rivals, and its final triumphant verification by Hertz, naturally caused the pendulum to swing to the other extreme; so that in the early nineties students of physics learned much of tubes of force and ethereal displacement, but had little to do with electric charge, except as a rather old-fashioned idea still useful for certain purposes, but really only a short name for a certain mathematical function of the ethereal displacement.

Time, however, has wrought its revenges. When Maxwell's theory was applied to the finer details of the electrical and optical behavior of matter, especially of moving matter, it was found necessary to reintroduce the definite conception of electric charge in very concrete form; its atomic structure was recognized, and the name 'electron' was given to the atom of electric charge. These theoretical conclusions of Lorentz and Larmor have been strikingly confirmed by a great number of experimental results in widely different fields of investigation. The discovery of the Zeeman effect, the investigation of the nature of cathode rays and of the ionization of gases by J. J. Thomson and his followers, the phenomena of radioactivity and many other facts new and old find their natural explanation in terms of the electron theory. Indeed we have some ground for anticipating a much wider extension of the theory; it is not impossible that we may come to believe that all matter is made up of electrons, which will thus form the raw material out of which the material universe is constructed.

In the book under review, Sir Oliver Lodge has given a simple and lucid account of this theory, of its triumphs and difficulties, and the possibilities of its future development. He tells us that the book "is intended for the student of general physics, and in places for specialists, but most of it may be taken as an exposition of a subject of inevitable interest to all educated men." It is in fact not quite a 'popular' exposition of science in the ordinary sense, and one will look in vain for the exaggerations and over-statements which are too often characteristic of such works. It appeals rather to the discriminating *amateur* of scientific knowledge who has some knowledge of electricity and who will not be hopelessly frightened or repelled by an occasional simple algebraic or trigonometrical expression.

Readers of this class will doubtless find this book of great interest, and the general view and perspective of the subject will also be of value to the professional physicist. It is written with the spirit and enthusiasm which we have learned to expect from Sir Oliver Lodge since the publication of his 'Modern Views of Electricity'—nearly twenty years ago—that remarkable little book which, by a masterly use of mechanical analogies and models, gave an exposition of Maxwell's theory that was understood and enjoyed by many non-mathematical readers and was at the same time capable of exciting the admiration of Helmholtz. It can not be said that the present work is the equal of the earlier book; but taken together they afford a view of the progress of electrical theory during the past thirty years which can hardly be got elsewhere in the same compass.

H. A. BUMSTEAD
YALE UNIVERSITY

SOCIETIES AND ACADEMIES

THE GEOLOGICAL SOCIETY OF WASHINGTON

AT the 191st meeting of the society, held on Wednesday, April 10, Mr. F. E. Wright exhibited four new attachments for the petrographic microscope and gave a brief description of each: (*a*) Double screw micrometer ocular by means of which the optic axial angle of any section under the microscope can be measured in convergent polarized light, if one optic axis, at least, appears within the field of vision. (*b*) A special cross-section ocular, which consists of a Ramsden-Czapski ocular with a fine coordinate scale in the focal plane and which serves the same purpose as the double-screw micrometer ocular, although slightly less accurate. (*c*) An improved Fedorow-Fuess universal stage on which new hinged graduated circular scales have been added and found to increase the general applicability of the stage considerably. (*d*) A new condenser-lens system combining the advantages of the ten Siethoff system with the quantitative movements of the universal stage.

Regular Program

Mr. Bailey Willis discussed the geological problem of the Alps especially from a structural standpoint and compared the conclusions reached by him with those held by the majority of European students of the Alps.

At the 192d meeting of the society, on April 24, Mr. Bailey Willis presented and briefly explained a diagram on the possible development of recumbent folds as a consequence of thrust faults of great magnitude. This paper will be published in SCIENCE.

Mr. F. L. Hess exhibited informally specimens of gypsum from Lost Hills, fifteen miles south of Tulare Lake, California.

Regular Program

A Peculiar Form of Metamorphism in Siliceous Sandstone: Mr. GEO. P. MERRILL.

Mr. Merrill described a peculiar and apparently very local form of metamorphism of the siliceous sandstone which underlies the Aubrey limestone in the vicinity of Canon Diablo, Arizona. The materials shown and discussed were from the so-called Coon Butte Crater, and were of unusual interest, not merely on account of the character of the phenomena, but as bearing upon the question of the origin of the crater itself.

It was shown that the sandstone, composed of very pure quartz sand, passed by gradations into an almost wholly crystalline rock composed of remolded quartz granules with a well-developed rhombohedral cleavage, and thence into glassy and pumiceous forms closely resembling a bleached liparite pumice. The metamorphism was accompanied by no apparent chemical changes that could be considered constant or essential. Mr. Merrill discussed the bearing of this metamorphism upon the origin of the crater, but refrained from committing himself upon the subject.

Normal Faulting in the Bullfrog District: W. H. EMMONS. This paper will be published in SCIENCE.

Some Problems Concerning the Formation of Coal: DAVID WHITE.

Under this title Mr. White presented an outline of the more important questions relating to the deposition of vegetable matter and its transformation into coal. He observed that the 'transportation' theory appeared to be fully vindicated in a number