

Metabolism of Creatin and Creatinin. Otto Folin. (Introduced by H. P. Bowditch.)

Nature and Cause of Old Age. Charles S. Minot.

Phanerascopy, or Natural History of Signs, Relations, Categories, etc.: A method of investigating this subject expounded and illustrated. C. S. Peirce.

Heterogeneous Elements of the Continent as Factors in the History of North America. Bailey Willis. (Introduced by Charles D. Walcott.)

Present State of Knowledge as to Motions of the Terrestrial Pole. S. C. Chandler.

The Origin of the Ores of the Cobalt-Silver District of Ontario. Charles S. Van Hise.

Geological and Biological Study of the Cambrian Brachiopods. Charles D. Walcott.

The Catalysis of Sulphuric Acids. J. M. Crafts.

The Miocene Mammals of Patagonia. W. B. Scott.

Sun-Spot Spectra and their Bearing on Stellar Evolution. George E. Hale.

A Few Notes of Progress in the Construction of an Aerodrome with a Historical Introduction. Alexander Graham Bell.

The Use of the Statistical Method in the Systematic Study of Bacteria. Charles E. A. Winslow. (Introduced by A. A. Noyes.)

Biographical Memoir of Fairman Rogers. Edgar F. Smith.

#### BUSINESS MEETING.

[Boston, November 20 and 21, 1906.]

#### REPORT OF THE COMMITTEE ON COOPERATIVE RESEARCH IN CHEMISTRY.

The committee to which has been referred the plan of cooperative research in chemistry relating to the study of the equilibrium of chemical reactions, which plan was submitted to the Academy at its last meeting, offers the following report of progress:

The committee has taken under consideration the various aspects of the plan proposed, and has decided to express to the Academy its approval of the main features of it, and to recommend that the development of the plan be proceeded with. The committee is convinced that the line of investigation contemplated by the proposal is one of the broadest and most important fields of experimental research in chemistry now opened for cultivation, and that it is one which lends itself in an unusual degree to cooperation on the part of many investigators, even of those who may not possess unusual facilities or the highest experimental skill. Even though it should not prove practicable to secure a large measure of cooperation and though it should happen that no large addition to science directly result, yet the committee believes that the definite formulation and publication by the Academy of a systematic plan of research in this new field would, of itself alone, be a valuable contribution to the advancement of the subject, by drawing the attention of investigators in general to it and by bringing before them in a definite way the present frag-

mentary state of our knowledge of it and the directions in which that knowledge can be most effectively extended.

With respect to the ultimate securing of cooperation in the execution of the work, the committee recognizes the fact that this is of the nature of an experiment: but it believes that it is one well worth entering upon; for if even moderately successful, it would result, in the opinion of the committee, in a general stimulation of the research spirit in our institutions, and especially among the younger generation of chemists. In this connection, it may be mentioned that one of the methods of securing cooperation which the committee has considered as most likely to be effective would be to address, after the plan had been fully formulated, personal letters to those in charge of the chemical departments of various institutions, asking whether there were not members of their staffs who would like to participate in this general plan of research indorsed by the Academy by taking up the investigation of some special problem connected with it.

The committee therefore asks to be informed whether, in view of these considerations, it is desired that the committee prepare a more definite statement of the general considerations underlying the proposed subject of investigation, the present state of knowledge in regard to it, and an outline of a systematic plan to further research, with the understanding that this more developed plan be submitted to the Academy for its approval before proceeding to its publication or to the securing of cooperation in its execution. If this should be desired by the Academy, the committee respectfully asks that it be permitted, in the preparation and execution of the plan, to secure the assistance of Dr. G. N. Lewis, an investigator who has devoted himself successfully to work in this special direction, and that there be placed at the disposal of the committee the funds which have been generously offered to the Academy for this purpose by the trustees of the William E. Hale research fund.

ARTHUR A. NOYES.

EDWARD W. MORLEY.

THEODORE W. M. RICHARDS.

The report was approved and the committee instructed to take further steps to carry out its suggestions.

The original proposal, which was made to the Academy during the April session, is as follows:

#### COOPERATIVE RESEARCH IN CHEMISTRY

The principle of the second law of energetics that any change in the state of a system, whether physical or chemical, is capable of producing under the most favorable conditions a definite quantity of work is one whose importance has been extensively recognized within the last few years. This importance arises not only from the direct significance from a scientific and technical standpoint of this maximum quantity of work obtainable from any physical change or chemical reaction, but also from the fact that from its value alone can be directly computed the equilibrium conditions of the chemical reaction in question, the direction in which under specified conditions it will take place, and the electromotive force of any voltaic cell in which the reaction goes on reversibly. The hopes of the earlier thermochemists that the heat effect attending chemical reactions would enable us to predict the direction of the occurrence and their equilibrium have been shown both empirically and by the energy principles to be unfounded; but in this work quantity we have a reliable means of making such predictions and in it therefore a satisfactory measure of the hitherto indefinite conception of chemical affinity.