SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FRIDAY, JUNE 7, 1901.

CONTENTS:

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

FRANÇOIS MARIE RAOULT.

THE death of Raoult, on April 1, 1901, removes from France one of her most brilliant investigators. Raoult was born at Fournes (Nord) on May 10, 1830, and was, therefore, nearly seventy-one years old when he died. After finishing his academic training in Paris, he began his career as a teacher in the Lycée at Reims at the age of twenty-three. In 1870 he was called to the chair of chemistry at Grenoble. In 1889 he was elected dean of the Faculty of Sciences in Grenoble—a position which he held until his death.

The earlier work of Raoult was devoted to problems of a purely physical nature. His thesis, presented for the degree of Doctor of Science was on 'The Electromotive Force of Voltaic Cells,' and much of his earlier work had to do with the phenomena connected with electrolysis.

His most important work, however, and that with which his name will always be connected, was done after 1870, while at Grenoble. When Raoult took up the study of the lowering of the freezing-point and of the vapor-tension of solvents by dissolved substances, our knowledge of these phenomena was hardly more than qualitative. A few regularities had been pointed out by Blagden, Coppet, Wüllner, Emden, Rüdorff and others, but scarcely any generalization worthy of the name had been reached.

risks in human life without taking unnecessary ones.''

This is very true. The analyst should ever stand between the public and a questionable supply, and the consumer, rather than the water purveyor, should be given the benefit of any doubt.

The book closes with a consideration of the adulteration and examination of milk, butter, cereals and fermented liquors.

The authors have had so large and varied an experience with the subjects upon which they write, that the excellence of the present contribution to sanitary literature was to have been expected. WILLIAM P. MASON.

BOOKS RECEIVED.

Qualitative Chemical Analysis. ALBERT B. PRESCOTT and OTIS C. JOHNSON. New York, D. van Nostrand Co. 1901. Pp. xi + 420.

Tierleben der Tiefsee. OSWALD SEELIGER. Leipzig, Wilhelm, Engelmann. 1901. Pp. 49. Mk. 2.

Monographien aus der Geschichte der Chemie. Vol. VI. Pt. 2. *Christian Friedriech Schönbein*, 1799–1868. GEORGE W. A. KAHLBAUM and ED. SCHAER. Leipzig, Barth. 1901. Pp. xii + 331. $9.30.

The Induction Motor. B. A. BEHREND. New York, Electrical World and Engineer. 1901. Pp. 105.

SCIENTIFIC JOURNALS AND ARTICLES.

The Journal of Physical Chemistry, April. 'On an Improved Method of determining Latent Heat of Evaporation and on the Latent Heat of Evaporation of Pyridin, Acetonitril, Benzonitril,' by Louis Kahlenberg. Description of an improvement on the Berthelot apparatus for determining the latent heat of evaporation, in which the liquid is boiled by an electrically heated platinum spiral, and the results obtained by its use. 'A Class of Relations between Thermal and Dynamic Coefficients,' by George H. Burrows. 'Minumum Boiling-Points and Vapor Composition, II,' by Morris R. Ebersole. A study of acetone-benzene solution, with a classification of all mixtures of two solvents which have been studied, according to vapor-pressures and boiling points. 'On Clapeyron's Equation,' by Paul Saurel. 'Note on the Fundamental Equations of Multiple Points,' by J. E. Trevor.

IN the *American Geologist* for March, S. W. McCauley presents a discussion on the 'Trap Dykes of Georgia.' He states that they are all of the same age, and vary from an inch to two hundred feet in width and extend from a few rods to many miles. The 'Plan of the Earth and its Causes,' by J. W. Gregory, is continued from the February number, in which the writer concludes that the plan of the earth may be attributed to the unceasing shrinkage of its internal mass. Professor E. W. Claypole contributes some interesting notes on 'Petroleum in California.' 'Some Salient Features in the Geology of Arizona' is discussed by William P. Blake. This is followed by 'The Lake Systems of Southern Patagonia.' The author of this article divides the lakes into three classes—residual or salt lakes, glacial and tectonic. The April number contains a valuable contribution to the geology of 'The Piedmont Plateau of Georgia,' by Thomas L. Watson. The rocks of the region are divided into three different kinds, viz., the even-grained, massive granites, the porphyritic granites and the granite-gneisses. Of the even-grained granites, all but two possess biotite as a principal element, while hornblende is entirely wanting; the porphyritic granites are, with one exception, massive, with a composition somewhat similar to the massive granites, and in some places showing a gradation from one to the other; the granite-gneisses form extensive areas of schistose rock, similar in composition to the other two, and are believed to be metamorphosed eruptive granites. The author, after furnishing considerable proof, concludes that the region consists of eruptive granite which has been subject to the action of metamorphism and weathering, thus differentiating into the other two kinds of metamorphic rock. The age of the area is supposed to be Archæan, but it is crossed by numerous dykes of a later origin. Mr. Oscar H. Hershey contributes a paper entitled 'California Metamorphic Formations,' in which he describes the formations of the Klamath mountain region. He concludes that the schists of the upper region are somewhere between the Archæan and Devonian in age, and favors the earlier rather than the later date. This is followed by a paper, 'Fossils near Montreal,'

by Charles Schuchert, in which he describes the fauna of Saint Helena as from the Helderburg and the middle Devonic ages.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON.

THE 340th meeting was held on Saturday evening, May 4th.

T. H. Kearney presented a paper on 'Loeb's Investigations into the Action of Ions upon Animal Structures, as supplemented by Studies with Seedling Plants,' quoting from Loeb's published papers at some length, special stress being laid upon their value as illustrating the theory of the rôle of ion-proteid compounds in vital phenomena. In experiments with animals it was the action of mixed solutions of two or more salts, as compared with that of each salt in a pure solution, which led to the development of this theory. The result of numerous experiments with seedling plants, as to the limit of concentration of solution which permitted the maintenance of vitality, agreed in many important points with the results obtained by Loeb in experiments with animals. In both cases salt solution was found to be highly toxic, while the addition of a second salt in many cases largely neutralized this poisonous effect and notably increased the degree of concentration of the more toxic salt in which root tips could survive during a twenty-four hours' culture.

Experiments were made with salts of magnesium (sulphate, chloride), of sodium (carbonate, sulphate, chloride and bicarbonate) and calcium chloride, all of which are important components of 'alkali' soils in the western United States. In pure solution they proved toxic in the order named, the limit of endurance for magnesium sulphate being approximately a $\frac{1}{080}$ normal solution, that of calcium chloride a $\frac{1}{4}$ normal. Mixtures were made of equal volumes of definite concentration of each two of these readily soluble salts, and of each of them with the comparatively insoluble magnesium carbonate, calcium carbonate and calcium sulphate, which are likewise abundant in the alkali soils.

In several cases addition of a sodium to a magnesium salt considerably raised the limit of concentration of the latter endurable by the roots of the white lupine (*Lupinus albus*), but the most striking results were obtained by the addition of calcium, either as chloride or sulphate, to magnesium and sodium salt solutions. Calcium sulphate, added in simple excess of the powdered salt, proved extraordinarily efficacious in neutralizing the toxic effects of other bases, increasing the maximum endurable concentration for sodium sulphate from $\frac{3}{400}$ to $\frac{1}{2}$ normal, and for magnesium sulphate from $\frac{1}{800}$ to $\frac{3}{5}$ normal.

In a $\frac{2}{5}$ or $\frac{3}{5}$ pure solution of magnesium sulphate the root cells were strongly plasmolyzed, while in a corresponding solution plus an excess of calcium sulphate no trace of the plasmolyzing action could be detected. The effect of calcium sulphate upon the corresponding chlorides was much less marked. Hence, while in some cases the effects of mixtures could be ascribed to the kations (basic radicle) alone, in others it seems clear that the anions are also able to make their influence felt. Hydroxyl ions, dissociated in very dilute solutions of sodium carbonate (Na_2CO_3), and sodium bicarbonate ($NaHCO_3$), markedly stimulated the growth of the roots, just as Loeb found them to stimulate the gastrocnemius of frogs, to absorption of water from, and rhythmical contraction in, a sodium-chloride solution.

The results of this investigation, which was undertaken at the request of the Chief of the Bureau of Soils of the Department of Agriculture, are to be described in a forthcoming bulletin of the Division of Vegetable Pathology of that Department. They are believed to have considerable economic significance, apart from their bearing upon the question of the influence of ions upon organisms.

Under the title 'A Kinetic Theory of Evolution,' Mr. O. F. Cook suggested, on the basis of studies in the Diplopoda and other groups, that evolution be interpreted as a kinetic phenomenon or process of gradual and spontaneous accumulation of variation instead of a reaction to external conditions. It was also held that the differentiation of species is a process quite distinct from evolutionary progress, and that selection and isolation may conduce to the