the species bearing generalized roots may have a relatively wide distribution, occurring in widely different habitats. Cowles[6] gives an interesting example of the relation between root variation and species range. The red maple grows in swamps and also on dry grounds. The root character of the tree on the two habitats is very unlike. In the swamps the tap root is not largely developed, but the laterals are prominent, while in the dry situation the reverse is the case, the tap root being the leading characteristic of the root-system.

The problems which deal with the presence of trees are primarily physiological and have mainly to do with the absorption and conservation of water. Each of these capacities varies with the species. Of the root relations that of the root-water table is of prime importance, owing to the fact that the soil horizon, tapped by the roots of trees, derives, by capillarity, from the level of ground water, its perennial supply of moisture. In the semi-arid regions probably the roots of most trees attain to the perennially moist soil, sometimes to the water table itself, at least for a portion of the year, and, in the more humid regions, the roots frequently do so. In both regions, certainly in the former, wherever such is not the case, a variety of factors, which need not be discussed in this place, are of greater importance in the survival of the species than the water table depth, although the character of the root-systems may still be of much, possibly of definitive, importance.

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INORGANIC COLLOIDS AND PROTOPLASM[1]

BREDIG[2] has shown that inorganic colloidal solutions, such as silver, platinum and gold, may act as catalyzers in certain chemical reactions, such as the reduction of hydrogen peroxide to water, and while chemists have studied the problem of the action of catalyzers from this standpoint, biologists have signally avoided attempts[3] to determine whether the activities of the enzymes of the organism can be imitated by these inorganic catalyzers. It must be remembered in any such examination that, as Ostwald[4] has demonstrated, along with others, enzymes of any nature are incapable of instigating a reaction, but their function is solely that of modifying the Guldberg-Waage mass action equation for a given instance, either accelerating or retarding a reaction already in progress. Therefore, we should not expect to find a striking modification of the actions or of the structure of any organism, if any effect were obtained by the application of inorganic "enzymes."

In a series of experiments, I attempted to determine whether colloidal platinum and a colloidal gutta percha[5] gave evidence of any effect upon simple organisms, such as protozoa and single-celled plants. Platinum black was obtained by the use of the house current, reduced to about 70 volts, passing it through a lamp-board, the current delivered to water which had been glass-distilled, the electrodes being of platinum, according to the Bredig method.[6] In order to be certain that the solution was desirable for experimentation, it was examined over a Zeiss dark-ground con-

[6] "Text-book of Botany," Vol. 2, Ecology, p. 506.

[1] Presented in abstract form to the Columbia University Biochemical Association and outlined in the *Biochemical Bulletin*, II., 1, 1912.

[2] "Anorganische Fermente," Leipzig, 1901.

[3] Benj. Moore (in "Recent Advances in Physiology and Biochemistry." L. Hill, Edt. London: Edward Arnold, 1908; Chapter 4, p. 122) mentioned having performed injection experiments with platinum sol on animals, but he gives no details; he obtained negative results. Autolysis has been shown to become accelerated under the influence of colloidal metals. (See Ascoli and Izar, *Biochem. Zeitschr.*, Bde. 5, 7, 10, 14 and 17; also Doerr, same journal, Bd. 7.)

[4] "Uber Katalyse," *Vortrag auf d. Ges. d. Naturf. u. Arzte*, 1901.

[5] Professor Henry A. Perkins, of the Jarvis Physical Laboratories, Trinity College, prepared this solution after the formula which he used in the laboratory of Professor Perrin at the Sorbonne, and I am indebted to him for the kindness.

[6] *Zeitschr. f. angew. Chemie*, 1898, p. 951.

denser, but no attempt at ultra-filtration, which might easily have been done by using collodion as Schoep[7] has done, was made, for I was not concerned in these experiments with the size of the particles. The solutions were found to be quite active and little or no deposit of the coagulated platinum ["sponge"] was obtained, which, of course, is not active catalytically to the extent to which platinum black is. I have tried colloidal iron in somewhat similar experiments, but it is assuredly not to be expected that this colloid would give results with living things, on account of its low activity as an inorganic catalyzer. The gutta percha was dissolved in ether and emulsified by water and alcohol, and then the whole mass was dialized through fish-bladder for three months to remove the alcohol and ether. It was examined before using, to determine the activity as far as the Brownian movement could be taken as a criterion.

Paramecium, Stentor, Blepharisma, Euglena, Phacus and diatoms, *Ceratium* and other desmids were used as material, but more exact work was done with *Paramecium* and *Stentor*. One set of experiments consisted in isolating individuals of these species and making drop-cultures of them in a small amount of the colloidal solution; a second series was conducted in salt dishes, where the amount of colloidal solution was about 2 cm^3. I ran checks with tap-water.

It was to be expected that the platinum solution, at any rate, would prove to be toxic, but this was not the case, for the organisms lived without any suggestion of being in an unwholesome medium; the same was true for the gutta-percha solution. The rate of cell-division was noted, comparing that of the individuals under experimentation with that of the checks. The rate was found to vary in no appreciable manner. One variable may have been introduced, and that was food, but I could not devise any way of eliminating the difficulty. Bacteria were present in all of the solutions and, of course, in the medium of the control experiments. The bacteria were kept down appreciably by keeping the dishes in strong light, but this did not eliminate them.

From these experiments, which are by no means exhaustive, I conclude that the inorganic catalyzers, such as I have used, are not effective in appreciable manner on protoplasm. It may well be that protozoa are not affected, while other organisms, or portions of other organisms, may be. As an instance where protozoa are not affected by an agent that is markedly effective in inducing cell-division in certain tissues in higher forms, I may mention the power of certain azo-compounds, notably Scharlach R, to cause proliferation of epithelium in mammals, so that they have been introduced into dermatology for treatment of burns on the skin, and it has been noticed that workers in anilin factories[8] show thickenings of the skin caused by contact with the dyes. I have grown *Paramecium* in drop-cultures with granules of Scharlach R, which were seen to enter the bodies of the organisms and to occur in the food vacuoles, but there was no evident increase either in the size of the organisms or in their rate of fission. Obviously, the dye is not responded to by protozoa as it is by epithelium; perhaps this specific response is somewhat similar to conditions in experiments with inorganic catalyzers. In these experiments, both a suspensoid [colloidal Pl and an emulsoid [gutta percha] were used. It is to be remembered that the study of inorganic catalyzers has been carried on principally with the latter group, but this does not mean that the former one is not promising, or for *a priori* reasons should not be expected to give results, except in so far as it does not follow the criterion of Emil Fischer[9] of a stereochemical relation, wherein enzymes of whatever nature are defined as optically active catalyzers; platinum black is not optically active, which may account for its inability to influence organisms. The same may be said of the gutta-percha solution.

P. S.—Since the above account of my experiments was written, there has appeared a very

[7] "Über ein neues Ultrafilter. Wo. Ostwald's Kolloid-Zeitschr.," Bd. 8, p. 80, 1911.

[8] See Sachs, *Wien. klin. Wochenschr.*, Bd. 24.

[9] *Chem. Ber.*, Bd. 27, S. 3230.

interesting communication from the Barnard Skin and Cancer Hospital in which Dr. Leo Loeb describes experiments with colloidal copper, derived by the Bredig method, upon neoplasmic growths; he finds that intravenous injections cause cessation and absorption of the cancerous tissue.

MAX MORSE

TRINITY COLLEGE,
October 25, 1912

SOCIETIES AND ACADEMIES

THE AMERICAN PHILOSOPHICAL SOCIETY

AT a meeting of the society on February 7 Dr. Paul Heyl presented a paper on "Platinum in North Carolina." A belt of platinum-bearing rock runs from Danville, Va., to Cedar Falls, N. C., a distance of some seventy miles. Assays of as much as 4 or even 8 ounces per ton are occasionally found, but the average content is too small to be commercially important. The platinum in the rock is very rich in iridium. The deposit has been known for about seventeen years. An examination of the watershed of the region for 200 miles from the center for placers yielded negative results.

On March 7 the following paper was presented: "A Historical Account of the Early Microscopical Studies in the Structure of Animals and Plants with Reference to the Development of the Cell Theory," illustrated by lantern slides, by R. M. Pearce, professor of research medicine, University of Pennsylvania.

A sketch of the work of Hooke, Malpighi, Grew, Swammerdam and Leeuwenhoek in the last third of the seventeenth century, with remarks on the early microscopes, followed by the story of the development of our knowledge of plant and animal structure, as Lieberkuhn's (1739–48) studies of the finer structure of animal tissue, Trembly's (1744–47) observations on the division of protozoa, Brown's (1833) description of the nucleus and Treviranus's (1806) and Mohl's (1828) studies of the vegetable cell. A discussion of the improvements in the microscope up to 1830 and of the fundamental observations of Schleiden (1838) and Schwann (1839) which, followed by those of Virchow (1858), definitely established the cell theory. A short discussion of later work on the nature of cell protoplasm (Dujardin, Schultze) and the study of the nucleus and the process of division of cells, concluding with Flemming's observations in 1882. Illustrated by lantern slides showing many of the original drawings which accompanied the reports of the various fundamental observations.

THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 33d annual meeting was held in the hall of the Cosmos Club, December 14, 1912, with Vice-president W. P. Hay in the chair. Reports of officers for the year 1912 were received and the annual election of officers took place. The election resulted as follows:

President—E. W. Nelson.

Vice-presidents—J. N. Rose, Paul Bartsch, W. P. Hay, A. D. Hopkins.

Recording Secretary—D. E. Lantz.

Corresponding Secretary—N. Hollister.

Members of Council—Hugh M. Smith, Vernon Bailey, Wm. Palmer, A. B. Baker and A. K. Fisher.

THE 505th regular meeting was held January 11, 1913, with President E. W. Nelson in the chair and 54 persons present. The chairman appointed standing committees on publications and communications for the year.

C. V. Piper exhibited a vase made of wood and covered with a thin veneer of "silk-wood." This veneer is cut from one of the large *Polyporus* fungi and takes a beautiful polish.

A. S. Hitchcock and E. W. Nelson each reported his recent return from a successful collecting trip, the former having collected grasses in Jamaica, Trinidad and Tobago, while the latter had secured birds and mammals in Arizona.

The regular program consisted of three communications:

The Rediscovery of Œnothera grandiflora: S. M. TRACY.

The speaker gave an account of two trips made by him to the locality of Bartram's original discovery of this species (1776). The locality is near Dixie Landing, Alabama, and the flower described by Bartram was found abundant over a limited area. A second visit was made last year in company with Dr. Hugo de Vries.

The Problem of the Identity of Œnothera Lamarckiana: H. H. BARTLETT.

The speaker gave a history of various cultivated strains of plants of this species and its hybrids. He predicted that its original habitat and identity —as yet unknown—would eventually be discovered, probably in America south of the United States and on the Pacific Slope.