This meeting will bring to a close a half century of scientific progress in Indiana. Many noted men, such as David Starr Jordan, Barton W. Evermann, John M. Coulter, John C. Branner, T. O. Mendenhall, O. P. Hay, J. C. Arthur, W. A. Noyes, Harvey W. Wiley, W. S. Blatchley and others have been active in the development of the academy, and it is the intention to honor these men at this semi-centennial meeting.

WILL E. EDINGTON,
Press secretary

THE COLORADO-WYOMING ACADEMY OF SCIENCE

THE seventh annual meeting of the Colorado-Wyoming Academy of Science was held on December 1 and 2, 1933, at the University of Wyoming, Laramie, Wyoming.

Friday afternoon and Saturday morning were given over to the reading of papers in section meetings. A total of 118 papers were presented—in chemistry 15; education 11; geology-geography 11; physics 16; plant science 25; psychology 9; social science 6; zoology 25. About 200 members and students attended the sessions.

At the annual dinner Dr. Aven Nelson, of the University of Wyoming, reported on "The Fifth Pacific Science Congress." Robert Niedrach, of the Colorado Museum of Natural History, showed moving pictures of Colorado wild life.

The officers for 1933–4 are: *President,* R. J. Gilmore, Colorado College; *vice-president,* H. M. Barrett, University of Colorado; *secretary,* W. C. Service, Colorado College; *treasurer,* C. T. Hurst, Western State College; *chairman of publications,* C. A. Hutchinson, University of Colorado; *representative to the conference of state academies,* J. C. Stearns, University of Denver. Members of the executive committee are: F. F. Ramaley, University of Colorado; A. S. Adams, the Colorado School of Mines; T. R. Garth, University of Denver; F. P. Goeder, Colorado Agricultural College; Laura A. White, University of Wyoming; P. E. Boucher, Colorado College; F. C. Jean, Colorado State Teachers College, *retiring president.*

The 1934 meeting will be held on November 30 and December 1, 1934, at the Colorado School of Mines, Golden, Colorado.

RALPH J. GILMORE,
Secretary

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A METHOD FOR STUDYING SOIL-PLANT NUTRIENT RELATIONSHIPS

SOIL investigators have given considerable attention to methods for displacing the soil solution, that may be comparable to the effect of plants in drawing nutrients from soils. The use of air pressure applied to soils in order to force nutrients in solution from the soil into plant roots and thence up through the stem of the plant to be collected and analyzed, is thought to be a new method of studying the relation between soil conditions and the intake of various soil solubles.

Briefly, the procedure consists of placing a suitable receptacle containing the root systems of plants grown in a nutrient medium, after the tops have been removed, into a pressure chamber and connecting the plant stubs to receiving flasks outside of the pressure chamber by means of glass and rubber tubing, then applying air pressure to the closed chamber. Field bean plants grown in soils were used in an investigation by this method and a relatively large volume of solution was obtained by the application of thirty pounds per square inch of air pressure to the soil at optimum moisture content in from twelve to twenty-four hours. Interesting data relative to soil and plant treatments and the growth of plants were obtained by analyzing the solutions collected.

This method offers a profitable means of attack in the investigation of problems in soil fertility and plant nutrition. Some special problems to which it may be applied are as follows: (a) The relation of the concentration of substances entering plant roots to their concentration in the nutrient medium; (b) the effects of the presence and concentration of an essential or non-essential element in the nutrient medium on the intake of other elements; (c) the specific nature of the ions that enter plant roots and the physical or chemical processes involved; (d) the effect of various soil conditions on the intake of soil solubles by plant roots.

The results of the investigation with bean plants, using the air pressure method for obtaining the solutions, will be published at an early date.

C. W. LAURITZEN
MICHIGAN STATE COLLEGE

A SIMPLE STAIN FOR NUCLEAR STRUCTURES IN LIVING AMOEBAE AND CYSTS

AMONG the practical methods for the identification of intestinal amoebae, iodine solutions have been much used. They are simple, act immediately and show the nuclear chromatin distribution well enough for purposes of differentiation between species. Eosin or neutral red in dilute solutions are also useful for bringing living amoebae and cysts into contrast with the associated fecal debris.

The proposed staining solution is methyl alcohol saturated with methylene blue. This combines and surpasses the virtues of iodine and eosin solutions. If a small amount of feces is emulsified in a drop of water, an equal-sized drop of this stain mixed with the emulsion and a cover glass placed on the preparation, cysts and motile forms of amoebae will stand out as clear refractile bodies in the dark blue field. All fecal remains, with the exception of certain crystals, are stained dark blue and are thereby merged with the rest of the blue field. The whole preparation may be searched with the low power objective in a very short time. Examination with the 4 mm or oil-immersion lens will show the nuclear chromatin of amoebae and cysts to be selectively stained with the methylene blue. Chromatin beads about the nuclear membrane and karyosomes appear as distinctly as in haematoxylin stains of fixed preparations. The only precautions to be observed are to reduce the amount of light and to make thin preparations; either use small drops of fecal emulsion and staining solution, or use large coverslips to spread the mixture over a larger area.

Trophozoites are rounded up by contact with the methyl alcohol, but the nuclei may be seen distinctly, even in the presence of much ingested material. Frequently cultures of intestinal amoebae do not develop cysts, so that the diagnosis must be based on active forms. If these have ingested much particulate matter, especially starch particles, iodine is practically useless for staining the nucleus.

Castor oil and mineral oil droplets in feces are stained a light greenish-blue by this stain and do not have the clear refractile appearance of cysts.

H. E. McDANIELS

UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE AND ILLINOIS DEPARTMENT OF PUBLIC HEALTH, CHICAGO

SPECIAL ARTICLES

THE ISOTOPIC FRACTIONATION OF WATER BY PHYSIOLOGICAL PROCESSES[1,2]

ABSTRACT

DURING the process of the synthesis of organic compounds by a growing willow tree, an isotopic fractionation of hydrogen occurs, in the direction of a preferential selection of the heavier isotope, with the result that the sap and the combined hydrogen of the woody parts of this plant both yield heavy water. No isotopic fractionation occurs during the passage of the water into the tree through the root membranes.

(1) INTRODUCTION

During the growth of plants, water is imbibed through the roots, and hydrogen from this water is then utilized by the plant in the photosynthesis of organic compounds. In both of these processes there exists the possibility of an isotopic fractionation, that is, the possibility of a selective action of the organism with respect to the light and heavy isotopes of hydrogen. The purpose of this investigation was to determine whether any such selective action occurs.

(2) PERMEABILITY OF ROOT MEMBRANES TO LIGHT AND HEAVY WATER

In August, 1932, an experiment was started for the purpose of ascertaining whether an isotopic fractionation of water takes place during osmosis through the roots of growing plants. In this experiment cow peas were first employed. The plants were wax-sealed through holes in the tight cover of a large jar containing 30 liters of tap water. Nutrient salts and oxygen by aeration were supplied as needed.

After about three months, during which time 12 liters of water had been evaporated, the cow peas succumbed to an attack by aphids and were replaced by plants of Indian corn. When these had consumed one liter of water (1 month), they in turn perished during a cold winter's night and were replaced by rooted twigs of the weeping willow and the experiment continued during the winter. By April 18 only 225 cm^3 of the original 30 liters of water remained. After careful purification, the density of this residual water was measured and found to be normal (± 1 ppm).

The experiment was then repeated, this time entirely with growing willows. This was in the summer of 1933 and transpiration was much more rapid than in the first experiment. Again the residual water from 30 liters was found to have normal density (± 1 ppm).

In a third experiment a sample of heavy water (sp. gr. 1.000,053) was reduced from 370 to 165 cm^3 by transpiration through willow, and the residual water was found to be unchanged in density (± 1 ppm).

From these experiments it is evident that the light

[1] Publication approved by the Director of the Bureau of Standards, U. S. Department of Commerce.

[2] Most of the experimental results presented in this paper, together with a description of the methods employed in purifying the water and in measuring its density, will be given in a forthcoming publication,—*Bur. Standards Jour. Research*, 12, 1934.