the College of Agriculture and director of the stations of Louisiana University. He took up his new work in August, succeeding Dr. W. R. Dodson, whose resignation has been previously noted.

NEW appointments announced by the University of Chicago board of trustees include that of Thomas Griffith Taylor, now head of the department of geography in the University of Sydney, Australia, as professor in the department of geography. Dr. William Robinson has been appointed assistant professor in the department of pathology under the Otho S. A. Sprague Memorial Institute. Promotions include that of Ernest P. Lane to a professorship in the department of mathematics.

DR. SHERMAN C. BISHOP has resigned as New York State zoologist to accept a position in the University of Rochester.

DISCUSSION AND CORRESPONDENCE

THE CONSERVATION OF INTELLECT

PROFESSOR WILLIAMS[1] has indicated a very important problem which has a marked bearing on the future of scientific research in America. He notes that many students borrow money to enable them to complete their college course and that under that handicap of debt they can not go on to graduate study without having the financial assistance of a university fellowship or assistantship.

Professor Williams points out that there are all too few fellowships available and that a routine assistantship offers far from ideal environment for fostering creative scholarship. Accordingly he suggests:

> If funds were available to finance a group of fellowships for this class of men, as has been done by the National Research Council for the men who have just taken their doctorate, I believe help in fostering research work would be applied at the most strategical period in the career of a young researcher. At present there are not enough graduate assistantships to take care of all those who desire to do graduate work. These additional fellowships would add greatly to the opportunities for advanced work which the assistantships now partially supply.

I wish to add a fervent "Amen!" to Professor Williams' plea. The entire department of agriculture of the University of Minnesota has available each year *three* fellowships, each carrying a $500 stipend and exemption from university tuition. There are approximately 250 graduate students majoring in the various fields of agricultural science at Minnesota. Each year from forty to fifty applications for the three available fellowships pass through my hands in my capacity as chairman of the Graduate Group Committee for Agriculture. In the past five years applications for these three fellowships have been received from nearly every state in the Union and from several foreign countries.

It is the task of this committee to decide which three of the applicants shall receive the awards.

Each year every member of the committee goes away "heart-sick" from the meeting at which the awards are decided. Time and again we read on the application blank the aspirations of the student to begin or continue graduate work, ending with the plea that such aspirations can not be realized unless some small income is assured.

In a group of fifty applications it is a relatively easy task to select twenty-five which have definitely inferior credentials as compared with the other twenty-five. This does not mean that the lower group is not of graduate caliber but rather that they do not appear from the evidence available to be definitely superior. Accordingly this group is eliminated from further consideration.

Then comes the task of selecting within the upper group. Here again we can choose with less certainty a group of ten or twelve who appear to show more promise or who have had more basic science courses than the others. The choice here is fraught with a much greater probability of error than the first selection process.

Now comes the task of selecting *three* from the outstanding ten or twelve! Frankly, it can't be done—except by casting lots, and that is what occurs every year. All the students in this upper group should go on for graduate study. All have promise of a brilliant future. Only three can receive fellowships, and to my own knowledge some students in this upper group, but whose fate, as luck would have it, was to be denied the fellowship stipend, are now teaching in high schools or working at various tasks in industrial laboratories in order to live and pay the accumulated debt, when in justice to ourselves as a cultural nation they ought to be either candidates for the doctor of philosophy degree, or, having received that degree, ought to be in professors' chairs blazing new paths for others to follow.

No greater problem of *conservation of national resources* faces the American people than the conservation of intellects which are allowed to atrophy because of the stultifying influence of routine drudgery which comes to many who have chosen the path of science as undergraduates, only to find that the doors of advancement are locked to those who do not have the higher training represented by post-graduate

[1] SCIENCE, 68, 244–5, 1928.

work and whose financial resources are so limited that they can not reach the goal toward which they started.

May I add here that I am not appealing for fellowships in any particular branch of science but for *fellowships available in any field of science.* Too often when a fellowship is available only for chemistry, the recipient may be inferior in potential ability to some one who aspires to be a physicist when no fellowship is available in that field. Neither am I appealing necessarily for fellowships at Minnesota, for the student should be permitted to select the *men* under whom he wishes to work and not be limited to a university which will grant an assistantship permitting work toward a Ph.D. degree, for, after all, graduate schools are known by their works, by the *men* on the faculty and not by the name of the university or by the ornateness of the buildings. There may be only one man in America who stands preeminent in the field in which the student wishes to do major work, in which case the fellowship should permit the student to work with this man rather than waste his time on a second-rate instructor in another university where a fellowship happens to be available.

The Graduate Group Committee for Agriculture at Minnesota awards the three available fellowships, as nearly as is possible, solely on the basis of merit of the individual and not on the basis of departments. Such a committee having similar duties could well function in our sister institutions and would be a necessity in the event that additional funds for any considerable number of fellowships became available.

In closing may I add that while I rejoice at the increasing number of $1,500 to $2,500 fellowships which are being provided for *post-doctorate* fellowships, nevertheless I can not help wondering whether *five* $500 post-baccalaureate fellowships, to assist talented students to begin post-graduate work, might not yield greater scientific dividends than does a single $2,500 post-doctorate fellowship. In any event, I'd like to see the experiment tried, for I believe I can predict the results.

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CONE-IN-CONE ON CONCRETIONS FROM THE DEVONIAN OF NEW YORK

THE fact that the concretions occurring in the Devonian of New York[1] contain a well-preserved fauna and flora is in keeping with similar occurrences both in this country and abroad. This feature of fossiliferous concretions was pointed out in my article on concretions in the "Treatise on Sedimentations" (p. 514).

[1] A. Emil Alexander, "Devonian Concretions of Western and Central New York," SCIENCE, 68: 85, 1928.

Mr. Alexander notes that some of these concretions have "the peculiar cone-in-cone structure *for which no explanation has as yet been offered.*"[2]

I should like to call Mr. Alexander's attention to the fact that the occurrence of cone-in-cone on and in concretions is mentioned in the article referred to above (p. 502), and that the origin of this interesting structure is discussed in an article on cone-in-cone in the same volume (pp. 515–518). The origin is discussed in more detail in my paper on "Cone-in-Cone," in volume 4 of the *American Journal of Science* (pp. 199–213), where there is also another list of references in addition to those on page 515 of the "Treatise on Sedimentations." I think Mr. Alexander will find that an explanation for this structure has been offered.

Attention should also be called to the statement: "In the marcasite nodules, the iron pyrite has replaced the organic, as the case may be, by its silver white metal." It is not "iron pyrite" (for pyrite is a mineral separate and distinct from marcasite), but *iron disulphide,* that has replaced the organic material.

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WINTER ROOT GROWTH OF PLANTS

IN a series of investigations at the Boyce Thompson Southwestern Arboretum, it has been found that the roots of certain plants, generally thought to be dormant in winter, make definite, continuous growth at this season. This is true of both deciduous and evergreen species and embraces cultivated and wild forms. Notable examples are *Prunus persica, Prunus armeniaca, Covillea tridentata, Simmondsia californica, Cupressus arizonica* and *Opuntia laevis.* The rate of root elongation per day, of the species under observation, was found to vary from 9 mm in November, as the maximum, to .5 mm in February, as the minimum. Growth was evidently affected by change in the seasonal temperature of the soil, but there appeared to be no direct or close correlation between daily growth and soil temperature.

In the study of individual species the average daily root elongation of the peach (*Prunus persica*), covering the winter period between November 4, 1927, and March 31, 1928, was 2.10 mm. The average daily growth for November was 5.55 mm, December 2.01 mm, January 1.65 mm, February .90 mm, and March 1.16 mm.

In contrast to this group of plants showing decided growth in winter, other plants were found which, under the same environmental conditions, make no

[2] Italics mine. W. A. T.