of much of the feldspar, and of many of the Maine gems and a large variety of minerals; the Lewiston Falls and a number of other localities. It is hoped that the geologists from other parts of New England will take part in the meeting, and it is expected that Professor George P. Merrill, curator of the National Museum at Washington, will deliver an address in the evening. The headquarters of the association will be at the Auburn Chamber of Commerce.

UNIVERSITY AND EDUCATIONAL NOTES

BOWDOIN COLLEGE receives $500,000 under the will of the late Edward H. Blake, of Bangor.

PHILIP A. LEHENBAUER, professor of plant pathology at the University of Illinois, has accepted a position as head of the department of horticulture at the University of Nevada.

DR. FREDERICK C. LEONARD has been appointed instructor in astronomy and mathematics, in charge of the work in astronomy, at the Southern Branch of the University of California in Los Angeles.

PROFESSOR BENJAMIN A. WOOTEN, Ph.D., head of the department of physics at the Alabama Polytechnic Institute, has been elected professor of physics at Washington and Lee University, in the place of Dr. Walter LeConte Stevens, who has been retired and made professor emeritus.

LELAND H. TAYLOR, who received the degree of doctor of science from Harvard in 1922, has been elected to an instructorship in zoology in West Virginia University.

DISCUSSION AND CORRESPONDENCE

CONCERNING THE BOTULINUS TOXIN

RECENTLY Bronfenbrenner and Schlesinger[1] have reported the death of laboratory animals (mice) as a result of the intraperitoneal injection of 3×10^{-21} cc of a solution of the toxin of *B. botulinus*. In a preliminary communication[2] concerning the matter they state that under suitable "conditions of the experiment the *botulinus* toxin which ordinarily kills mice in amounts not smaller than 3×10^{-7} cc can be increased in potency to such an extent that 3×10^{-21} cc occasionally and 3×10^{-18} cc quite regularly kills mice of 18-20 g. in less than 48 hours after intraperitoneal injection. While the total solids of such a minute dose of toxin amounts to only 3×10^{-23} g (this amount also includes the inorganic portion of the medium), the toxic product thus obtained, nevertheless, possesses all the essential characteristics of bacterial toxins," etc.

Because of the smallness of the quantity it seemed worth while to examine some of the consequences involved. Since a gram molecule of any compound contains 6.06×10^{23} molecules then one gram of water or approximately 1 cc would contain $1/18 \times 6.06 \times 10^{23} = \frac{10^{23}}{3}$ molecules and 3×10^{-21} cc would contain $\frac{10^{23}}{3} \times \frac{3}{10^{21}} = 10^2$ molecules

From the quotation given it is apparent that the solution of toxin can not be even a one per cent. solution, but assuming that it is a one per cent. solution and that the molecular weight and density of the pure toxin are the same as those of water then 3×10^{-21} cc would contain only one molecule of toxin. However, the molecular weight is probably higher than that of water and not even one molecule in a hundred would be a toxin molecule. Consequently the average 3×10^{-21} cc quantity of solution would contain no toxin. If one takes the larger quantity, 3×10^{-18} cc, which quite regularly kills mice, and assumes that the molecule has ten times the molecular weight of the water molecule then one hundred molecules of toxin would be present.

In the case of the smaller quantity it is unlikely that at best more than one or two molecules of toxin could have been present and since the animal was killed one seems forced to conclude that the life of an organism is dependent upon the integrity of one or two cells or that the action of the toxin is catalytic and

[1] *Journal American Medical Assn.*, 78: 1519 (1922).

[2] *Proceedings Society Exper. Biology and Medicine*, 19: 1 (1921).