spores produced upon the germination of the thick-walled resting spores are placed in a hanging drop culture in company with a piece of the unfolding leaf of the corn plant (in this case Golden Bantam) many of the zoospores will eventually come to rest on the surface of the leaf and will develop after three days at 23° C. into somewhat irregular, slipper-shaped structures. These vary considerably in size and are anchored to the host cell by a coarse, branched rhizoidal system of limited extent which arises from a small apophysis. At maturity an innumerable number of zoospores, estimated in some instances to be in excess of 300, are formed within this sporangium and are ultimately discharged through a broad pore formed after the deliquescence of a single apical papilla. These spores are similar to those produced by the germinating resting spores but are markedly smaller (gametes?). After discharge, another and often a third sporangium may be formed within the original one. Similar sporangia have also been observed by the writer to be formed by *Physoderma menyanthis*.

Not only do these observations seem of interest from a purely mycological standpoint in establishing the fact that *Physoderma zeae-madyis* possesses a sporangial stage comparable to that of certain other genera of the Chytridiales, but it is hoped that they will serve to call attention to a hitherto unsuspected method whereby this exceedingly destructive fungus is quickly and extensively disseminated.

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GRAPHIC STATISTICS

(1) THE article in SCIENCE for January 12 in which Dr. C. I. Bliss describes the representation of a frequency-distribution[1] is of interest in that it betokens an increasing appreciation of the advantages of this graphic method. The method is hardly new, and in 1930 I described how "the figures of the original table are added up step by step, so as to give the total frequency not exceeding the upper limit of each class interval, and ordinates are then erected to a horizontal base to represent, to a special scale, these integrated frequencies as parts permille; a smooth curve may be drawn through the tops of the ordinates. The special frequency scale is the scale of deviates of the normal curve for each permille of frequency."[2]

Dr. Bliss proposes to multiply these deviates by 1.34_5 and to add 5, so as to transfer the origin from the median to the position defined by the frequency 0.1 permille. This would seem to be a work of supererogation, and I venture to suggest that the use as a scale of frequency of "probits," the arbitrary units derived in this manner, can only lead to needless confusion.

(2) In advocating the use of his table of "probits," Dr. Bliss refers to the greater ease of determining the straight line of best fit by the simple regression equation. In this connection, I would like to invite attention to a graphical method for the determination of a linear function of X approximating to Y for a range of corresponding values (X, Y).[3] The plotted values are divided into two classes by the median of X and the required straight line divides each class into equal numbers. This straight line is unique when the number of values of (X, Y) is $4n+2$ or $4n+3$. In other cases, to avoid ambiguity, the following procedure is suggested[4]: When there are $4n+1$ values, include the median in each class into which it divides the values; when there are $4n$ values, include the two "medians" in each class.

(3) In 1930, when I discussed the graphical representation of a frequency-distribution, I was in ignorance of Mr. Hazen's work[5] and I ventured to suggest the name *Permille* for the special coordinate paper upon which the frequency curves were plotted. It may be of interest to mention that this name is being adopted by the largest publishers of graph paper in England in preference to "arithmetic probability paper."

(4) With a limited number of observations, just as it is more expedient to find the median by inspection without determining classes of equal interval, so also it is more precise, and sometimes easier, to plot a frequency curve directly from the observed values. Furthermore, whatever the number of observations, it is always desirable to plot the outlying values as individual points.

With $(n-1)$ observations, the frequency curve can be drawn by plotting the rth value in order of magnitude against the ratio r/n.[6] This does not appear to be generally known, and Mr. Hazen falls into error in stating (*loc. cit.*, p. 1549) that, if there are 50 terms in the series, the first will be plotted on the 1 per cent. line, the second on the 3 per cent. line, etc.

With nine observations, the values in order of magnitude are plotted against 100, 200, 300, . . . 900 permille. When ninety-nine observations are available, it is generally convenient to plot (on permille paper) every tenth value in order of magnitude together with the five values at each end of the range.

[1] C. I. Bliss, "The Method of Probits," SCIENCE, 79: 38, 1934.

[2] A. F. Dufton, "Graphic Statistics: Permille Paper," *Phil. Mag.*, 10: 566, 1930.

[3] A. F. Dufton, "Correlation," *Nature*, 121: 866, 1928.

[4] A. F. Dufton, "The Reduction of Observations," *Phil. Mag.*, 10: 465, 1930.

[5] A. Hazen, "Storage to be Provided in Impounding Reservoirs for Municipal Water Supply," *Trans. Amer. Soc. Civil Engineers*, 78: 1539, 1914.

[6] A. F. Dufton, "Graphic Statistics," *Proc. Phys. Soc.*, 46: 47, 1934.

(5) In conclusion, may I remark that there appears to be hardly any branch of science in which it would not be helpful to plot frequency-distributions. Such graphical representations not only help to prevent erroneous judgments but, to the practised eye, convey also a wealth of information.

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A TEST FOR HEAVY WATER IN WATER FROM DEEP OIL WELLS

THE writer has found that the density of water associated with petroleum does not differ from that of ordinary surface water within the limits of measurement, estimated to be not more than two parts per million. The two samples examined were from oil wells slightly more than five thousand feet deep. The geological formation of the source in one case was Oligocene and in the other, Upper Eocene. In each experiment five gallons of water containing oil and water impurities were purified by fractional distillation with the usual precautions and the density of the final sample (800 ml) was determined by the float method of Richards.

The writer is indebted to Mr. George Corless, of the Humble Oil and Refining Company, and to Mr. Gordon B. Hanson, of the Petroleum Rectifying Company, for the collection of the samples.

ARTHUR F. SCOTT

SOCIETIES AND MEETINGS

THE VIRGINIA ACADEMY OF SCIENCE

THE Virginia Academy of Science held its twelfth annual meeting at the State Teachers College at Harrisonburg on May 4 and 5, with a registered attendance of 355.

At the council meeting a resolution was adopted favoring a new and more effective pure food and drugs act. At the open meeting on Friday night Dr. I. A. Updike, of Randolph-Macon College, gave a striking demonstration of the cold-light producing power of 3-aminophthalhydrazide.

The annual prize of fifty dollars was awarded to Dr. E. P. Johnson, of the Virginia Polytechnic Institute, for a paper entitled "The Etiology and Histogenesis of Leucosis and Lymphomatosis of Fowls." Three other papers were such close competitors for the prize that their authors were given honorable mention and a special certificate was issued to each. These were: Mr. Ladley Husted, of the Blandy Experimental Farm of the University of Virginia, "Cytological Studies on the Peanut, Arachis, II. Chromosome Number, Morphology and Behavior, and Their Application to the Problem of the Origin of the Cultivated Forms"; Dr. Rolland J. Main, of the Medical College of Virginia, "Diurnal Changes in Alveolar Carbon Dioxide as Effected by the Visceral Control of Respiration"; and Dr. E. G. Pickels, of the University of Virginia, "Adaptations of the Air-Driven Ultracentrifuge."

The ultracentrifuge developed at the University of Virginia was demonstrated in action and its adaptation to biological research emphasized. This centrifuge runs on and by air and the only practical limit to its speed is the ability of the steel rotor to hold together. A large number of biological exhibits and demonstrations were shown, especially such as could be used in teaching high-school science. There was also a symposium on the teaching of high-school chemistry.

The following officers were elected for the coming year:

President: Dr. William T. Sanger, of the Medical College of Virginia; *President-elect:* Professor Ida Sitler, of Hollins College; *Secretary-Treasurer:* Dr. E. C. L. Miller, of the Medical College of Virginia; *Councilor:* Dr. F. L. Robeson, of the Virginia Polytechnic Institute.

For the Section of Astronomy, Mathematics and Physics: *Chairman,* Dr. C. L. Albright, of the University of Richmond; *Secretary,* Professor Mary J. Cox, of Hollins College.

For the Section of Biology: *Chairman,* Professor Robert P. Carroll, of the Virginia Military Institute; *Sub-Chairman,* Dr. Harry G. Walker, of the Virginia Truck Experiment Station; *Secretary,* Professor George W. Chappelear, Jr., of the Harrisonburg State Teachers College.

For the Section of Chemistry: *Chairman,* Dr. John H. Yoe, of the University of Virginia; *Secretary,* Dr. Robert E. Hussey, of the Virginia Polytechnic Institute.

For the Section of Education: *Chairman,* Dr. W. J. Gifford, of the Harrisonburg State Teachers College; *Secretary,* Professor A. M. Jarman, of the University of Virginia.

For the Section of Geology: *Chairman,* Mr. William M. McGill, of the Virginia Geological Survey; *Secretary,* Dr. Marcellus H. Stow, of Washington and Lee University.

For the Section of Medical Sciences: *Chairman,* Dr. James H. Kindred, of the University of Virginia; *Secretary,* Dr. Harvey B. Haag, of the Medical College of Virginia.

For the Section of Psychology: *Chairman,* Dr. John M. McGinnis, of Hollins College; *Secretary,* Dr. R. C. Sommerville, of Lynchburg College.

The meeting next year will be held the first week in May at the University of Richmond.