insisted that honeycombed ice, wherever it may be, sinks like water-logged wood, and perhaps for the same reason.

This is too much for the physicist to take "lying down," for he refuses to believe that anything 10 per cent. lighter than water, as ice is, actually does or can sink in that water, whatever it may seem to do in the eyes of no matter how many witnesses. However, the ice does disappear. If it doesn't sink it must melt, but then how can it all melt in a few hours in the same water in which it had remained for weeks without melting?

To simplify the problem consider the behavior of ice on a lake of moderate size in a region where the water remains frozen over through the winter. The matters of importance are:

(1) When winter approaches the surface water cools, becomes denser and sinks until from bottom to top the water has the temperature appropriate to its maximum density, that is, 39° F., very nearly.

(2) As the surface water is further cooled it becomes lighter and remains at the top where, presently, it freezes to ice, and in so doing expands by about one tenth its original volume, and thus becomes approximately 10 per cent. lighter in the solid form than it was while in the liquid state. Hence it floats.

(3) In the process of freezing the dissolved substances in the water (in lake and stream water there always are such substances) are at first expelled by the forming ice, and later entrapped, in part, in the water between the crystal faces or in crevices of whatever kind.

(4) With a little further cooling this interfacial and cavity concentrate, which always has a more or less lower freezing point than pure water, also is frozen and the sheet of ice thus rendered continuous and solid throughout, save for such air bubbles as may be present.

(5) Under the influence of moderating weather and increasing sunshine as the spring days lengthen, the ice slowly warms up until its least pure portions, that is, those in the crystal cavities and over the crystal faces, melt—melt at a small fraction of a degree, often as little as one thousandth of a degree, perhaps, below the freezing point of the purer ice. When this happens the bricks (crystals) still are solid, but the mortar that bound them together is fluid, and the whole structure weak. The ice has become rotten, as generally expressed, and soon more or less cracked, honeycombed and water-logged. This last condition is partly, at least, caused by top-surface melting, and rain, perhaps.

(6) Even yet there has been very little melting at the under surface of the ice because there the water, being in contact with ice, is at the freezing (or melting) temperature, 32° F. And because, owing to protection from winds by the sheet of ice, there is no wave action to bring up the denser, *warmer* water from below.

(7) Comes a storm. The weak ice starts to break and soon is extensively broken. Then the churning action of the waves brings up an abundance of water of several degrees higher temperature than the melting point, and in the course of a few hours, or a day, at most, much of the ice, if not all of it, has melted away—gone so rapidly as to force the belief on most of us that it just must have sunk.

And this is how the ice sinks, "sinks" by melting quickly, on lake and on river, and the only possible way reasonably clean ice can sink. In short, while ice can be sunk by an overload of sand, or other dense material, all moderately clean ice, such as that on lakes, that has "sunk" hasn't sunk at all. It has just melted in a hurry.

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THE OCCURRENCE OF TRUE SPORANGIA IN THE PHYSODERMA DISEASE OF CORN

INCIDENTAL to a series of studies on the morphology and taxonomy of various chytridiaceous fungi, observations were recently made on *Physoderma zeae-madyis,* the causal agent of the serious and widespread "brown-spot" disease of corn prevalent throughout the southeastern states. The immediate concern of the writer was to determine whether the thick-walled, brownish, often elliptical or flattened intramatrical structures, termed by practically all pathologists and mycologists "sporangia," were in reality comparable to the sporangia found in other members of the order.

In addition to the aforementioned spores, which in nearly all species produce at maturity on the host the brownish, powdery pustules or lesions so characteristic of Physoderma infection, at least two species of the genus (*P. butomi* and *P. maculare*) have been found to form also thin-walled, somewhat irregularly shaped, extramatrical sporangia provided with an intramatrical rhizoidal system. These have been referred to as "ephemeral" or "temporary" sporangia. In contrast to the thick-walled, durable resting bodies which are seemingly formed from enlargements of an extensive intramatrical rhizoidal system, the "ephemeral" sporangia are formed from the body of the zoospore itself in the same manner as that found in species of *Chytridium* and *Rhizophidium.*

The purpose of this note is to point out that *Physoderma zeae-madyis* has been found by the writer to produce such extramatrical sporangia in abundance, and from their method of development, he regards them as the true sporangia of the fungus. If zoospores 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.