oil lamps are more likely to have had an indefinite position, as they must be handled to fill, but they had probably been much longer close to the situations in which we saw them. The less vegetative growth round them and the shadow effect behind the electric lamps would seem to show that it was the shorter light-waves which were requisite for this plant-life rather than contact-warmth or longer heat and reddish light.

With regard to the transport of the spores to the depths of the caves, some experiments by Profs. Zeleny and McKeehan are of interest. At the Winnipeg meeting of the British Association in 1909 they read a paper, followed by a discussion, on experimental verifications of Stokes's law for the fall of spherical bodies in a viscous fluid. They deduced a discrepancy between theory and experiment which would seriously affect the cloud estimate of gaseous ionisation. A fuller paper and further experiments were published in *Physikalische Zeitschrift* for February, 1910, in which they showed that while a cloud of minute smooth paraffin spheres or mercury droplets obeyed Stokes's law, yet similar experiments with the spores of Lycoperdon, Polytricium, and Lycopodium (all nearly spherical) gave only about half the terminal velocities required by mathematical theory. In NATURE of January 6, 1910, I offered an explanation of the apparent discrepancy shown by their results. By using a large-aperture microscopic objective with oblique illumination and spectrum-sifted blue solar light, the spores can be seen, just within the limits of visibility, to be coated with a mass of very fine hairs more than a radius in length. Substituting in Stokes's formula for the terminal velocity

$$v = \frac{2}{9}\frac{ga^2d}{\mu},$$

where a is the radius, μ the air viscosity, and d the density of the spores, the effective diameter comes out to be just double that of the measured diameter as seen in an ordinary microscope. This increase of effective diameter is what should be expected if a mass of air be entangled with the spore, or a tail of eddies formed. Hence the physical measurement of the terminal velocity of fall confirms the microscopic observation of the hirsute coating in all the three sets of cases where spores were used. The spores are enabled to be wafted great distances, therefore, much as are the seeds of a dandelion. No Brownian motion or rotation was observed, and this also suggests the coating of hairs. Since the spore-walls are not absolutely spheres or smooth in the sense that surface tension makes the droplets, some Brownian motion would have been expected if the external air molecules could strike directly on the spore-wall. The air entangled in the *chevaux de frise* of hairs will, however, soften down the average result of individual impacts of external air molecules by making the effect slower, and therefore the resultant average smoother.

Yet another indication of this coating of long hairs is the difficulty of wetting Lycopodium dust until it has lain on the water long enough to get water-logged, viz. long enough, probably, for the entangled air to be dissolved out. While the air is so entangled the effective density is more nearly one-eighth than a little above unity as measured by Profs. Zeleny and McKeehan.

That this hairy coating provides these spores with a special mechanism which enables them to be carried great distances, is only to make them resemble many other wind-borne fruits, and the fact is therefore likely from general considerations.

The method of verifying a difficult, almost ultra-microscopic, observation in botany by measuring the terminal velocity, as of a small falling body in a viscous fluid, is perhaps not common.

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Curious Formation of Ice.

IN NATURE of December 12, 1912, was published a letter wherein I described a curious formation of ice in the hope that some of your readers would be able to explain the cause, but there was no reply. After five years the formation occurred again in similar circumstances, and I submit a partial explanation which occurred to me on seeing this second example of the phenomenon. The ice was again formed on water in a rough hole or pond (about 2 ft. by 1 ft.) in the garden in clay soil. It was observed at 3.30 p.m. on January 13, 1918. The "dark, sinuous lines" in this case were about ¼ in. wide, and again ran "about parallel to the major axis" of the small pond. These dark lines were again due to the ridges of ice on the under-side of the ice covering the water, but were closer together than before, being about 1½ in. apart. The cross-section of the ridges was again of "dovetail" shape, the attachment being at the smaller end of the "dovetail."

The partial explanation appears to be as follows: A uniform layer of ice about ¼ in. thick forms over the whole surface of the water. The water slowly leaks out of the pond. The ice sags in the middle, keeping in contact with the water over its central area, but, owing to the support of the sides of the pond, the edges do not sag, and an air-space forms under the ice round its margin. The vertical cross-section of this air-space is a long, narrow triangle lying on one long side (the free surface of the water); the under-side of the ice forms the other long side, and the mud-bank of the pond the short side. At night, or at any other time when the temperature again falls below freezing point, the water at the margin (where the ice and surface of the water meet at an acute angle) freezes to the slab of ice and forms a ridge on the under-side of the ice. The water leaking slowly from the pond all the while would help the formation of the ridge. The next day, or when the temperature is again slightly above freezing, the water, continuing to leak away, allows a further slight sagging of the ice and the enlargement of the air-space, thus giving the space between the ridges of ice. The next freezing forms the second ridge, and so on.

This explanation appears to account for the ridges, their spacing, and their being roughly parallel to the major axis of the pond, but it does not account for the beautifully sharp, regular, and symmetrical formation of the cross-section of the ridges. One expects an asymmetrical cross-section instead of the symmetrical "dovetail." It has been suggested to me that the "dovetail" shape is due to the ridge being partly melted (where it is joined to the top slab of ice) during the period when the temperature is above freezing by the comparatively warm top surface of the water. This seems to be a possible explanation if the cross-section of the ridge when first formed is rectangular.

I hope that with this as a basis someone will be able to complete or modify the explanation of the curious formation of ice observed.

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