

ject. The reason no one has ever used a microscope in answering this and similar questions is undoubtedly because it is difficult to distinguish soil microorganisms without staining, and hard to stain them without staining the dead organic matter of the soil so deeply as to obscure the microorganisms. I have been struggling with these difficulties for the last two years and have at last found a method of staining that shows up the microorganisms of the soil without staining the soil particles or the dead organic matter. The details of the method are not yet ready for publication, but will be in a couple of months. Even though the technic is not yet perfected, it has furnished information that helps answer the question discussed by Waksman.

Briefly stated, every kind of soil micro-organism except mold hyphæ has been revealed. Bacteria are shown in large numbers. So are *Actinomyces* conidia; while masses of *Actinomyces* hyphæ have been observed. Algæ are not uncommon, and objects resembling mold conidia have been found. Some organisms have been observed that are strongly suggestive of protozoa. But of mold hyphæ only an occasional small fragment has been seen, even in soil rich in organic matter. I realize that this microscopic method may, for some unknown reason, fail to reveal mold hyphæ even when they are present; but it is at least a direct method, while Waksman's method is indirect.

Although Waksman was presumably correct in his statement that fungus mycelium is present in soil, it is doubtful whether it exists there to a significant extent. Of course fungi live in soil, particularly when large amounts of organic matter are present; but it is hardly fair to compare their activities with those of bacteria—as has often been done in the past, either directly or by implication—until it is shown that their mycelium is present in soil in sufficient quantities to compare with the large numbers of bacteria that are known to be present in active form.

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THE SUDDEN APPEARANCE OF GREAT NUMBERS OF FRESH-WATER MEDUSÆ IN A KENTUCKY CREEK

ON the morning of September 27, 1916, there was brought to me a large bottle of creek water in which were the badly decomposed remains of several small gelatinous bodies which to my great surprise were recognized as parts of medusæ. They proved to have come from Benson Creek near Frankfort, about twenty-eight miles from Lexington, and had been alive, it was reported, the preceding evening. The bottle of water containing them had been brought to Lexington by Mr. Ben Marshall of the revenue service, at whose Frankfort office it had been left by Mr. C. M. Bridgemord. The latter was said to have asserted that he saw "millions" of the animals in the water. There was reason for some doubt about the "millions," but the evidence of the decomposed bodies showed that there were some in the creek and I could not rest satisfied without examining the locality for myself. With Mr. Marshall I left Lexington in the afternoon and arrived at his office in Frankfort about 4 o'clock P.M., where we found Mr. Bridgemord and Mr. J. L. Cox of the office, who is an ardent angler and had become interested in the animals. These gentlemen very kindly took me in a motor-boat down Kentucky River, and a short distance below the L. & N. R. R. bridge we turned into the mouth of Benson Creek and proceeded up the stream. Kentucky River has been dammed below this point, so that the water is backed into the lower part of the creek, producing a rather narrow, deep body of water with but little current. We traveled up this backwater for about a half mile, when we reached the point where the medusæ had been captured. The water looked rather bad and unsuited to them at first, but became better farther up, though still not very clear and with its surface roughened by a slight wind. The water was quite warm.

As soon as we reached the part of the stream where the medusæ had been found we began to strain our eyes, attempting to get a glimpse of one in the murky water. Very soon one was seen, a floating, pulsating gray

object, a few inches below the surface, looking so much like a bit of rubbish that it would certainly not have been recognized had we not been looking for it. Then several were seen near each other, then a few scattered individuals, which were all carefully taken into bottles, or with a small collecting net. Finally in the center of the stream we encountered them in numbers and from that time until it began to get too dark to see well, the boat was generally surrounded by them. There were four people in the boat filling bottles and jars rapidly and in a few minutes we gathered some scores. Often with a single movement of the net I captured several and before taking it in had secured a half dozen or more. Dozens were in sight at one time, and it was soon evident that Mr. Bridgemord was right, and that in truth there were millions of these medusæ in the stream. I have worked on the aquatic animals of Kentucky waters for many years and was not prepared to believe that medusæ would ever be found within the state in such numbers, nor indeed in any fresh water of the United States. Several hundred living individuals were brought back to Lexington with me, and some of them were alive until the afternoon of September 28. One by one they died in our city water, though it was kept running slowly through the aquarium in which they were confined. The temperature may have been too low or the water otherwise unsuited to them. A good many were fixed with corrosive sublimate and preserved, so it may be possible to study them fully and determine something of their relationships.

Like others of their kind they are hyalin, excepting the flap-like yellow reproductive bodies attached to the four radial canals close to the stomach. The umbrella-shaped body is widely convex, the depth (in life) being perhaps one third the diameter. It measures from about 14 to 15 millimeters across. The manubrium is prismatic and extends downward to the level of the outer margin of the umbrella; the mouth is surrounded by an eight-lobed rosette. At the margin of the umbrella are four long tentacles (perradial), measuring about 14 millimeters, which are attached a short dis-

tance above the margin, and in life are disposed to extend upward. Secondary more slender tentacles are about half the length of these large ones and are also attached above the margin; then still nearer the margin are numerous minute tentacles thickly crowded at their bases.

Where this multitude of medusæ came from is a mystery. Mr. Bridgemord, who first saw them, has fished in the stream for a good many years, but never saw one until September 26. I myself have several times examined the upper part of the creek rather carefully in search of *Simulium* larvæ, and while Polyzoa (a *Plumatella*) were abundant on the rocks, nothing resembling a hydroid was present in the water. My examinations were made some years ago, however. The hydroid generation in the stream ought to be easily discovered if the myriads of medusæ are any indication as to its abundance. I have not yet had an opportunity to search for this stage, but expect to do so at once.

Of the three genera to which fresh-water medusæ have been assigned, the Kentucky species belongs unquestionably to *Craspedacusta*. Dr. Mayer¹ describes *C. sowerbyi*, first discovered in a lily tank in Regent's Park, London, and later found in other parts of the world, as 12 millimeters wide. The Kentucky examples are somewhat wider, but in other respects agree closely with Dr. Mayer's description, excepting in the length of the manubrium, which he says extends half its length beyond the velar opening, whereas in Kentucky examples it reaches to about the level of the bell margin. In this respect the latter agree with the *C. kawaii*, described by Oka² from the Yang-tse-kiang River, China, but differ again and agree with *C. sowerbyi* in having but three ranks of marginal tentacles instead of seven. Dr. Mayer³ thinks the Chinese species may be an exceptionally flourishing form of *C. sowerbyi*. The Kentucky examples are still nearer the medusæ described from Regent's Park. *Thaumantias lacustris* from a fresh-water lagoon in Trinidad is very

¹ "Medusæ of the World," 1910.

² "Annotationes Zoologicæ," Vol. 6, 1907.

³ *Loc. cit.*

different, being only from 2 to 2.5 mm. in diameter, the bell provided with 16 to 24 long tentacles with basal bulbs. The American *Microhydra ryderi*⁴ is only 0.4 mm. in diameter. It may be the young medusa of *Craspedacusta*, but shows some differences from young *C. sowerbyi*. *Limnocida tanganyica* Gunther, from Lake Tanganyika, Central Africa, has the gonads attached to the stomach, and differs otherwise.

Everything considered, it seems best for the present to regard the Kentucky medusæ as a form of *C. sowerbyi*.

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SCIENTIFIC BOOKS

With Scott: The Silver Lining. By GRIFFITH TAYLOR, D.Sc. With nearly 200 illustrations and maps. New York: Dodd, Mead and Co. Pp. xiv + 454. \$5.00 net.

Few volumes on polar exploration have been written so attractively as to the phases treated. The author has placed the reader in possession of the environment, wherein his own experiences are largely subordinated to the story, both of the incidents of antarctic research and also to the aspects of polar nature and its scanty fauna. The style is delightfully human, and is often brightened by humor. Indeed it admirably presents the silver lining of Scott's tragic expedition.

The biologist, the geologist and other scientists will find much information along lines usually ignored by polar authors, who are inclined to adhere closely to their specialties, and in technical fashion. These data are most welcome as the detailed memoirs, on the very extensive and most varied scientific researches of Scott's expedition, will not be completed for several years, though ample funds have been provided for their publication.

Botanists will be interested in the discovery of considerable patches of moss, on the east coast of Victoria Land, on which all the field work of Taylor was done—in two journeys. Taylor says:

⁴ Potts, SCIENCE, Vol. 5, 1885.

I was amazed to see a carpet of green moss, as flourishing as any in more temperate regions—three types of vegetation were present. One was the moss, to my unbotanical eyes, of universal distribution. The other two species may have been algae, one resembled the sea-weed called *Ulva*. The patch of green was 60 feet long and about 15 wide—possibly the largest area of vegetation south of 77° 5.

Sea-kale planted in the open air sprouted but did not develop.

Insects were found, the antarctic *spring-tail*, of which the record says. They were found

clustering among the whitish roots or hyphæ of the moss. They would be frozen stiff in a thin film of ice until one turned the stone into the sun. Then the ice would melt and they would move sluggishly about until the sun left them. I can not imagine a finer example of hibernation.

There were two species, one red and the other the millimeter-long blue, both unknown.

Of the antarctic sea—noted on the voyages to and fro—the author writes:

Microscopic life simply swarms in these polar seas, to an infinitely greater extent than in the warmer waters of the tropics, though one would be inclined to the opposite belief. . . . There is almost as much protoplasm per acre of ocean as there is in a well-cultivated crop on land. The description of the cycle of life is interesting, to a layman at least—from plankton to whale-killers.

Meteorologists will find data as to blizzards, etc., which are much less violent on the shores of Ross Sea than those reported by Mawson from Adelie Land. The record with Scott was that of July 12, 1911, when the maximum wind was 70 miles per hour, with a maximum temperature of 8°. The comparative mean temperatures for the years 1902–03 and 1911, were respectively as follows: (approximately) January, 24° and 22°; February, 13° and 15°; March, 4° and 8°; April, —8° and —2°; May, —14° and —12°; June, —15° and —14°; July, —16° and —22°; August, —17° and —23°; September, —15° and —17°; October, —7° and —2°; November, 13° and 13°; December, —23° and —21°. The minimum temperature mentioned is that of —77° experienced by Cherry in his visit to