

FOUND!— THE MICROBE OF LIGHT

**Prof. Molisch, of
Prague, Dis-
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Bright Glow of
the Firefly and
Other Insects
and Some Fishes
Is Caused by a
Germ, Which He
Has Bred in Col-
onies and Utilized As a Lamp.**

At last, the living lamp! The discovery, to which mankind has looked forward hopefully for so many years, has at length been made by a learned professor of the University of Prague—Dr. Molisch. He has constructed a lamp which derives its radiance from luminous microbes, and by its aid he is able not only to read fine print, but, as he has proved by experiment, to take photographs.

It was a dead fish shining in the night that first led him to investigate the subject of living light, for it had been proved by the experiments of other scientists that the luminescence in question was produced not by the fish, but by microscopic bacteria feeding upon the latter. Accord- ingly, Dr. Molisch was struck with the notion that it would be worth while to try to propagate these microbes arti- cially, and to see how they would behave under such con- ditions.

So he made a mixture of gelatine and "peptone," the latter being added to supply the requisite nourishment, and transferred to it a few of the microbes from the dead fish. Being thus provided with plenty of food, they bred rapidly and multiplied at a surprising rate, exhibiting, to the de- light of the Professor, a high degree of luminescence.

Germ That Make Meat Shine.
This, however, was only a beginning. The Professor meanwhile had found out the hitherto unknown fact that such luminescent microbes are of a number of species, and that they are among the most common of the bacteria which float about in the air. The reason that they are not observed more often is that they require for their propa- gation conditions that are rather exceptional. Now, there-

less, thanks to one kind, meats hung up in butcher shops or in cold-storage houses not infrequently exhibit the phe- nomenon in question.

Now, it happens that the microbe which causes meat to shine is, so far as known, the brightest of them all. Ac- cordingly, having discovered this fact, Dr. Molisch was anxious to obtain artificial "cultures" of it on gelatine. But not for two years did he succeed in getting hold of a sat- isfactory piece, from which he got the requisite bacteria— though, as he afterward ascertained, this species of microbe is in reality exceedingly common, and any scrap of beef that is left in a moderately cool place for three days, espe- cially if partly immersed in salt water, is likely to begin to shine.

It was not until "cultures" had been made of several kinds of these light-giving bacteria that it occurred to the Professor to try to turn them to some practical account. He could not help being struck, however, with the bright- ness of their glow, with its perfect steadiness and with its persistence, a single colony of microbes yielding an unflin- ing radiance for a number of weeks. Also, he found that, by exposure of a photographic plate, he was able actually

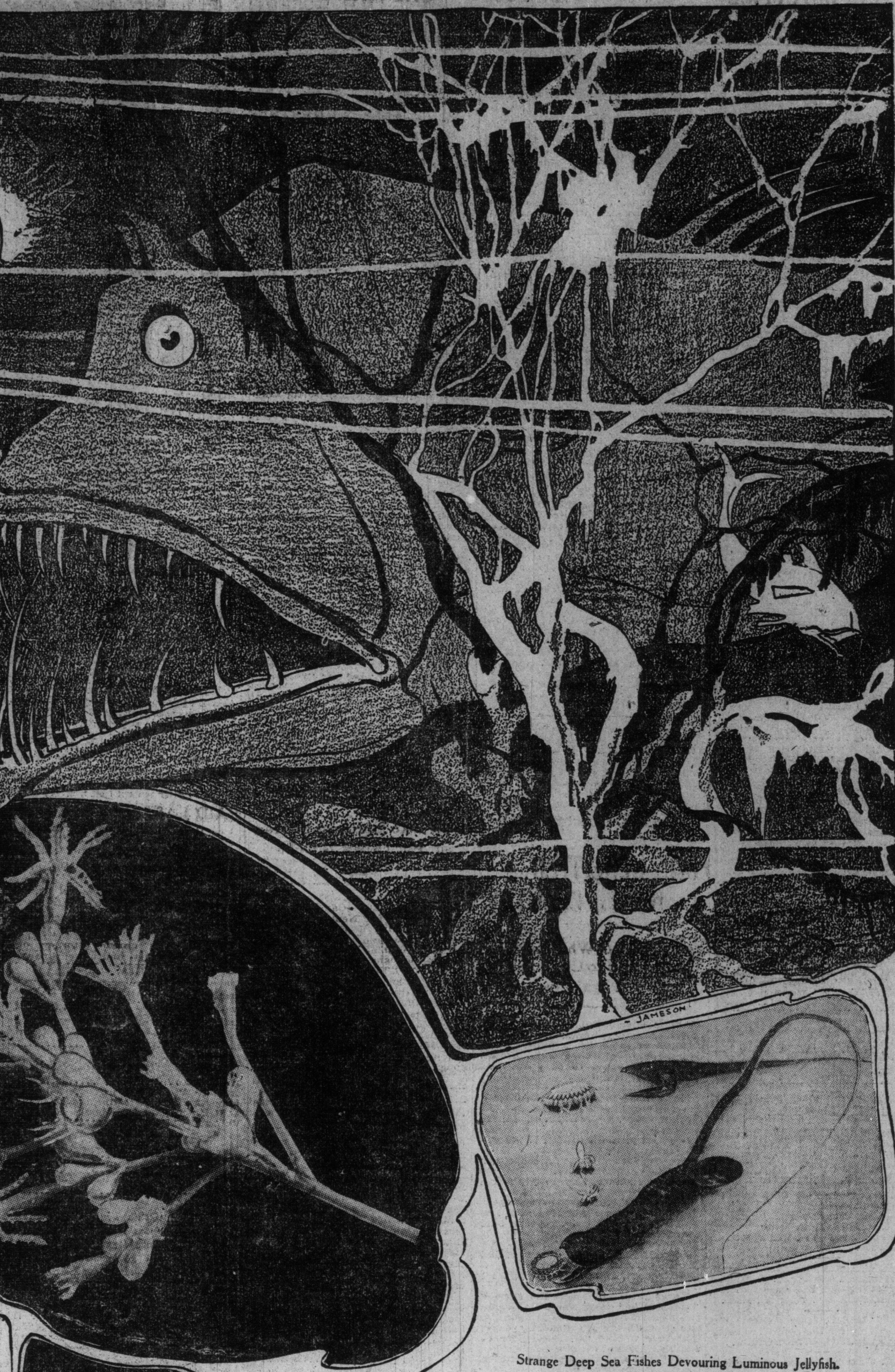
Naturally, the microbes immediately proceeded to feed upon the gelatine mixture and to multiply rapidly, the re- sult being that within forty-eight hours they had spread, in multitudes numbering millions, all over the inside of the hollow glass bulb, which was thus rendered brightly luminous. In a word, the bulb was converted into a lamp, by the aid of which the Professor was able to read a news- paper comfortably. Later on he even photographed ob- jects by the light it gave.

Now, according to the living lamp became at last an ac- complished fact. But, before going further in the discus- sion of its possibilities of practical usefulness in the fu- ture, it will be as well to consider the significance of the phenomenon upon which it depends—namely, of the lum- inescence of these microbes. What is it that is the cause of the radiance they exhibit? Hitherto science has been baffled by the mystery of it but Dr. Molisch believes that he has solved the problem.

As a result of his investigations, he is of the opinion that each of these microbes (which is a single cell) con- tains within itself a particle of a substance which has the property of emitting light. Nobody can say what this sub- stance is, for it has not been isolated, but its existence on that account is none the less actual. At some future day and probably before very long, the Professor thinks, it will be separated out. Meanwhile a name has been given to it by its discoverer, who calls it "photogen"—meaning simply "light-giver."

Now, according to the Professor's theory, this "photo- gen" is the same substance that is accountable for the light of the firefly, of the glow worm and of all the multi- tude of creatures, both small and great, which with their torches do illuminate the waters of the sea. The surface waters of the ocean, as everybody knows, are literally crowded with microscopic organisms which are brilliantly luminescent, an, sometimes, on a dark night, one may see floating on the waves hosts of jellyfishes like globular lanterns, and "Portuguese men-o'-war" resembling fire balloons.

In the case of the firefly—and the same idea applies to other animals which exhibit the phenomenon of lumines- cence—there is a considerable mass of structure composed of cells, each of which contains its particle of "photo- gen." To show how far this is true it may be mentioned that the "lantern" of one of these insects, carefully removed, may be dried and pulverized, and yet not lose its lumines- cent power.



Strange Deep Sea Fishes Devouring Luminous Jellyfish.

Plant-Like Colonies of Luminous Jelly- fish.

Thereupon it occurred to Dr. Molisch to make an ex- periment with a piece of chemical apparatus consisting simply of a glass tube expanded at one end so as to form a hollow bulb. He put into the hollow bulb some of the "culture" mixture, composed of gelatine, peptone and a lit- tle salt (for some reason unknown the luminescent bac- teria seem to thrive on salt), and, revolving the instru- ment beneath a stream of cold water from a faucet, caused the stuff to form a thin coat all over the inner surface of the glass.

The next step consisted in boiling the glass tube, so as to kill every possible germ of whatever description that it might contain. This having been accomplished, when the instrument had had time to cool microbes of two species, one obtained from meat and the other from fish, were in- troduced into the bulb with a sterilized platinum needle and "sown" upon the gelatine mixture. These two kinds were chosen because they were the most brilliant.

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to make them take a picture of the glass test tubes in which they were growing.

The surface waters of the sea are so literally crowded with luminescent protozoa (mere microscopic animalcu- lar life) that on a calm summer evening, especially in tropical latitudes, the splash of an oar will seem actually to break through a crush into molten gold. It is, one might say, so much living flame, sometimes greenish and sometimes silvery in hue. The phenomenon is one which nearly everybody has had an opportunity to observe, but hitherto the cause has been a mystery. Scientists have called it "phosphorescence," and have let it go at that.

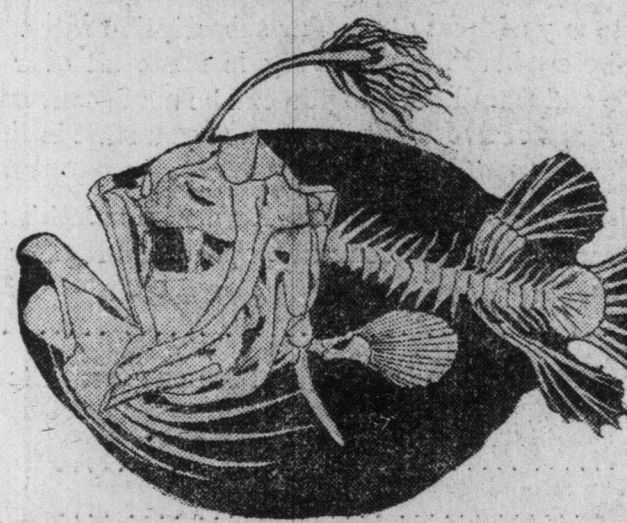
It has been reckoned that no ray of sunlight penetrates the ocean beyond a depth of 1,200 feet; below that level all is absolute and everlasting night—a darkness that, being the multitudes of creatures that dwell in this sunless realm, has provided many of them with light-giving or- gans—sometimes shining plates, as they might be called, on their heads or other parts of their bodies, in case of the abyssal fishes, and in other instances luminous bulbs oddly resembling incandescent lights.

Even in the very remotest depths there are strange carnivorous fishes which, as one might say, carry their own lanterns, and some of them are covered with luminous slime. Some of them gear their torches on the end of their fins, while others have them in rows along their sides. One species possesses organs somewhat resembling in structure bull's-eye lanterns, which it is able to turn on or off at will. Another uses its "electric bulb" as a bait to attract prey within its reach.

All Depend Upon "Photogen."
If the theory of Dr. Molisch is correct, the torches car- ried by all of the light-giving animals depend for their radiance upon only one thing—namely, "photogen." It is the same way with the "sea flame" and "sea light" in the depths of the ocean, which, growing on the bottom like plants, though in reality animals, form fairy-like, luminous for- ests covering the wide areas of sea floor. As for the minute organisms that illuminate so brilliantly the surface waters, they are mere bits of protoplasm. To the naked eye they appear like little stars emitting a steady light like that of a jewel. In the other kind of bug, as it sits on a twig or leaf, the greenish-yellow radiance, beginning as a spark, gradually increases in intensity until it glows like a torch; then as gradually fades again and goes out, presently reappearing, so as to remind the beholder of the effect of a revolving light at sea.

A common tropical firefly, plentiful in Central America, has two luminous spots on its thorax which appear to act when at rest. The light of the former is yellow, and seems like that of a jewel. In the other kind of bug, as it sits on a twig or leaf, the greenish-yellow radiance, beginning as a spark, gradually increases in intensity until it glows like a torch; then as gradually fades again and goes out, presently reappearing, so as to remind the beholder of the effect of a revolving light at sea.

The best artificial illuminant wastes and throws away 98 per cent of the energy utilized, only 2 per cent appear- ing in the shape of light rays. On the other hand, the light emitted by the firefly and the glow worm wastes but 2 per cent. In other words, the animal light is forty-eight



A Deep Sea Fish, Showing the Torch It Carries.

A Luminous Jellyfish.

Prof. Molisch's Living Lamp.