

Our Glowing Planet

By Julia Juarez

Imagine: it's the summertime, you're sitting on your porch enjoying the warm breeze and watching the sunset, when a small flicker of light catches your eye. It's a firefly! And like the stars, once you see one, you start to notice more. What you are witnessing is a phenomenon called bioluminescence. Bioluminescence is the production of light by a living organism due to a chemical reaction, diet, or even through a symbiotic relationship.

Let's dive in and talk chemistry first. Bioluminescent reactions occur when a substrate called luciferin is oxidized. This is done with a special enzyme called luciferase. With this reaction, light is created! Fireflies can control the timing of their light by using oxygen to initiate the reaction.

However, not all animals who luminesce can do it on their own. This is when symbiotic relationships or the diet of the organisms comes into play. A symbiotic relationship is one between two species who benefit from each other in some shape or form. In the glowing realm of bioluminescence, we can turn to the Hawaiian bobtail squid for an example of this.

The Hawaiian bobtail squid is a tiny two-inch long nocturnal squid. This creature houses a bacterium called *Vibrio Fischeri* in a special "light organ" located in the squid's mantle. In other words, the bacterium has a home and the squid glows. The glow protects the squid, as it allows them to camouflage their silhouette from predators.

Some other organisms get their glowing complexion from their diet. A great example of this is the Midshipman Fish, which does not produce its own luciferin. Instead, it eats Ostracod, a type of crustacean that does produce the substrate. It is believed that the Midshipman Fish then uses the Ostracod luciferin to create its bioluminescence.

So, why do living organisms need bioluminescence? Let's go back to the fireflies for an example. One of the main reasons that fireflies light up is to find love. Female fireflies will look for specific patterns of light that catch their attention to pick out their mate. Fireflies will also use their light to ward off predators, and will even use bioluminescence to show that they are displeased by something. Many deep-sea creatures that utilize bioluminescence use it as a way of blending in called counterillumination to avoid predators. Just like our friend the Hawaiian bobtail squid.

There are many organisms that will use bioluminescence and many of them are in the ocean. The ocean houses the majority of bioluminescent creatures that we see today. In fact, it is estimated that around 75% of ocean animals will utilize some form of bioluminescence.

Meanwhile, on land we can see different forms of bioluminescence in fungi, such as the Bitter Oyster, which happens to be the brightest of the bioluminescent mushrooms. Some bioluminescent mushrooms were utilized by Scandinavian tribes as markers in their route while venturing deep into the forest.

Another great use of bioluminescence is by glow worms or the fungus gnat. In the fungus gnat's larval stage, they emit a blue light from their abdomen and will release sticky strings that also glow from the gnat's bioluminescent molecules. These strings will entrap other bugs as a food source for the gnats.

Bioluminescence is an amazing phenomenon that many creatures utilize. With recent discoveries, we're seeing that even more organisms are emitting this spectacular light than we thought. Who knows what else our planet has to offer!

Photo caption: Hawaiian Bobtail Squid are one of the many marine organisms that are capable of bioluminescence

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