

Living Light: Bioluminescence and Biofluorescence

Factsheet

What is Bioluminescence and Biofluorescence?

Bioluminescent organisms produce their own light, and biofluorescent organisms absorb and re-emit light.

While bioluminescence and biofluorescence occur on land, and biofluorescence occurs in fauna as varied as parrots and butterflies, the vast majority of bioluminescent and biofluorescent creatures live in oceans.

Bioluminescence occurs inside an animal through a chemical reaction of two molecules (a luciferin and a luciferase) that releases light as opposed to heat.

Biofluorescence occurs when molecules in an organism absorb external light at one wavelength and reemit it as one or more different colors at lower energy wavelengths. Colors emitted include a wide range of greens, blues, reds, oranges, yellows, pinks and purples.

Fish, squid, jellyfish, worms, plankton, bacteria, algae, crusta-

ceans and some corals are among the many sea creatures that are bioluminescent or biofluorescent. Some marine creatures are both.

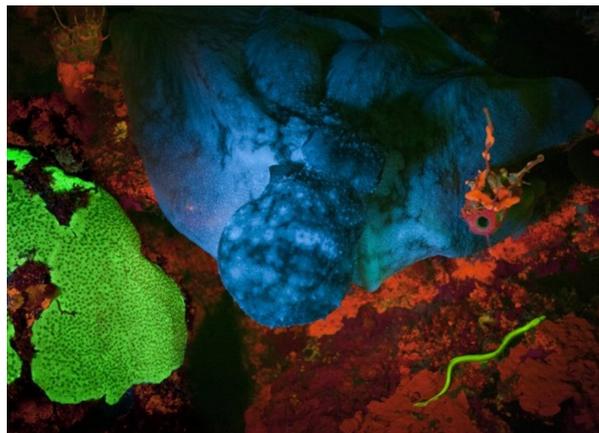


Image courtesy of Jim Hellemn

What Are its Uses?

Scientists think fish, corals and other organisms use bioluminescence and biofluorescence to communicate with their own kind, hunt, seek mates, hide, and flee from predators. Some say it is the ocean's visual equivalent of bird song.

Among its many uses -- the bioluminescent beak of the stauroteuthis octopus attracts plankton. Deep-sea jellyfish under attack respond with a ring of flashing blue lights to attract squid that will eat their predators. The pygmy shark mimics the intensity of surrounding light, causing its silhouette to disappear.

Many species have complex signaling systems, sometimes in alternating colors. Scientists are still trying to decipher what these signals mean.

Light and Color in the Ocean

Light wavelengths – and consequently color - travel differently

underwater. The ocean's visible light spectrum is mostly blue. Most bioluminescent marine organisms emit blue-green light, colors most easily seen in water at great distances.

Biofluorescence is invisible to the human eye. AMNH scientists use green long pass filters on their camera lenses that mimic fish corneas to spot the dazzling variety of ocean biofluorescence easily visible to fish with these specializations.

How do Humans Benefit?

Fluorescent proteins have revolutionized biomedical research. They are used to track nerve cell activity in the brain, study how viruses infect plants, do research on Alzheimer's and Parkinson's diseases, develop cancer treatments, and monitor tumor growth. Designers are investigating its uses for commercial lighting, clothing, and other purposes.

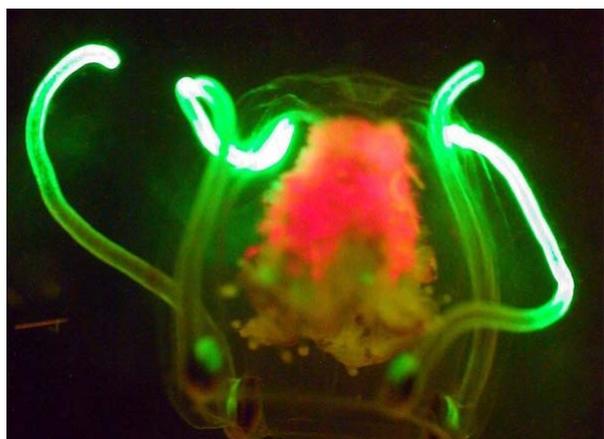


Image courtesy of Dr. Mikhail Matz and NOAA's Office of Ocean Exploration & Research

Compiled by Science and the Media

Sources:

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