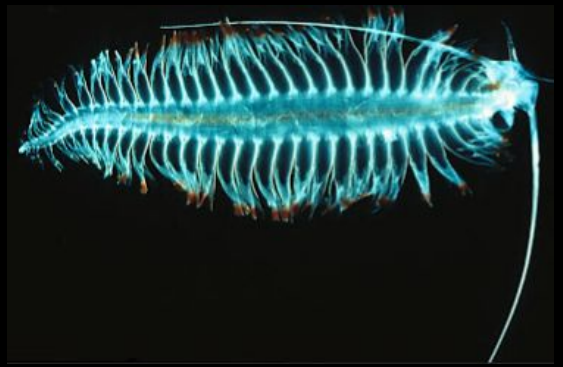
Bioluminescence

Bioluminescence is not rare, scientists have learned. It is so common in the oceans that it ranks as one of the planet's dominant traits.

BROAD, 2017



Explain

1. What is bioluminescence?
2. Why is bioluminescence important?
3. List of diversity bioluminescent organisms (terrestrial and ocean)
4. What are the enzymes involved in the bioluminescence process?

Explain

5. Bioluminescence chemical reaction
6. Is the color of the light the same for the terrestrial and the ocean organisms?
8. What is the difference between fluorescence and bioluminescence?
9. What is a plasmid?

What is bioluminescence?

- The visible light emitted from living organisms. (Nocturnal Light, 2012)

- The result of a reaction between luciferin and luciferase, a compound that occurs naturally in some organisms and oxidative enzymes, respectively. (Popular mechanics, 2020)



Why is bioluminescence important?

Its organisms can determine toxicity because the noxious substances reduce the glow by killing the bacteria.

Bioluminescence is used naturally to help animals attract mates, attract prey, camouflage themselves, and to deter predators.

List of diversity bioluminescent organisms (terrestrial and ocean)

- Fungi
- Algae and phytoplankton
- Bacteria (e.g. E.coli)
- Beetles
- Millipedes
- Bathypelagic fish
- Centipedes
- Earthworms
- Firefly
- Foxfire
- Shrimps
- Rays
- Squid and jellyfish

What are the enzymes involved in the bioluminescence process?

A luciferin is a light-emitting organic molecule;
a luciferase is a protein that catalyzes a light-producing chemical reaction;
cofactors are other molecules (e.g., calcium) that must be present for a particular bioluminescent reaction to occur.

Bioluminescence chemical reaction

Step one where a catalyzing element calls luciferase to react:

LH2 + MgATP + LUC LUC - LH2 – AMP + MgPPi

Step two where luciferase reacts with oxygen to trigger lucifern to produce light:

LUC - LH2 – AMP + O2 + OH -
LUC – OL + CO2 + AMP + light + H2O

Is the color of the light the same for the terrestrial and the ocean organisms?

Terrestrial organisms tend to produce **red, yellow or green** light.

Ocean organisms usually produce **blue-green or green** light because these colors travel well through the water without being absorbed, therefore enhancing the ability to be seen.

What is the difference between fluorescence and bioluminescence?

In fluorescence, energy from a source of light is absorbed and reëmitted as another photon.

In bioluminescence the excitation energy is supplied by a chemical reaction rather than from a source of light.

What is Plasmid?

- A small, often circular DNA molecule found in bacteria and other cells.
- Are separate from the bacterial chromosome and replicate independently of it.
- May be passed between different bacterial cells.


Bioluminescence gallery





A flotilla of fish follow a transparent drifting jellyfish.



Under white light, the greeneye fish looks very different, but its green lenses are still apparent.

