



Bioluminescence

What is bioluminescence?

- **The biochemical emission of light by living organisms such as fireflies and deep-sea fishes.**



Firefly



[This Photo](#) Angler fish



Lantern Fish

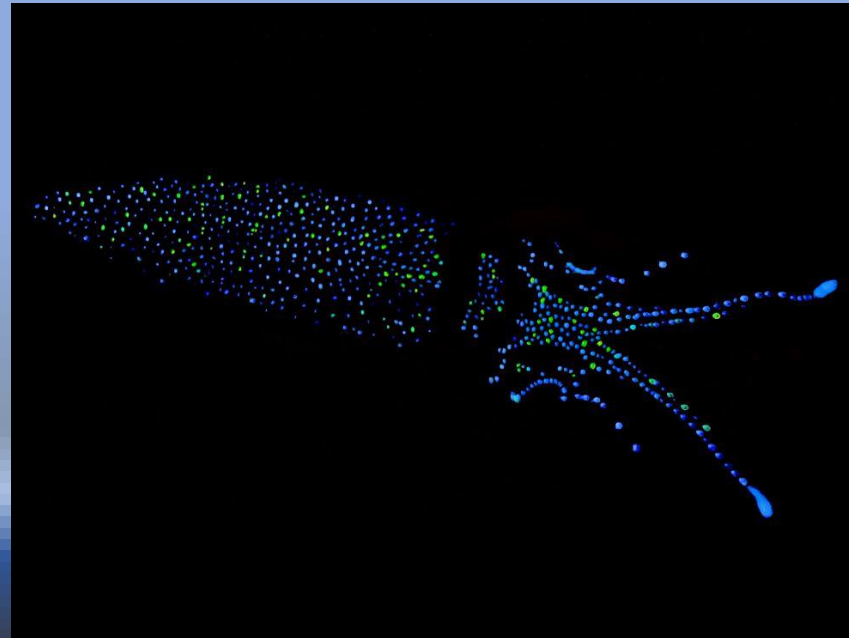
**You might remember the example of
bioluminescence from the movie
“Finding Nemo”**



<https://youtu.be/iNzmBDzw3XY>

**Bioluminescence is a type
of chemiluminescence.**

**Which is simply the term for a chemical
reaction where light is produced.**



Firefly Squid

**The 2 (two) chemicals involved
with bioluminescence are called:**

**Luciferin
and
Luciferase or Photoprotein**

Luciferin is the compound that actually produces light. In a chemical reaction, **luciferin** is called the substrate.

Luciferase is an enzyme.

An enzyme is a chemical (called a *catalyst*) that interacts with a substrate to affect the rate of a chemical reaction.

The interaction of the **luciferase** with oxidized (oxygen-added) **luciferin** creates a byproduct, called oxyluciferin.

More importantly, the chemical reaction creates **light**.

How Bioluminescence Works Luciferin and Luciferase



In bioluminescence, a **luciferin** produces light, and a **luciferase** allows the light-producing chemical reaction to take place.



In this reaction, the luciferase acts as a catalyst.



The luciferase allows oxygen to combine with the luciferin.



This reaction produces photons of light...



and the oxidized luciferin becomes inactive oxyluciferin.

Demonstration time!

You'll need:

- **Glow sticks (unbroken)**
- **3 vials with lids**
- **2 Pipettes**
- **Scissors or Leatherman tool**
- **Gloves**
- **Mask (the chemicals are kind of stinky)**
- **Safety glasses (in case you spill or when cutting the glowsticks)**
- **Paper towels (for any oops messes)**



Let's begin:

- **Prep your area to work**
- **Put on your gloves**



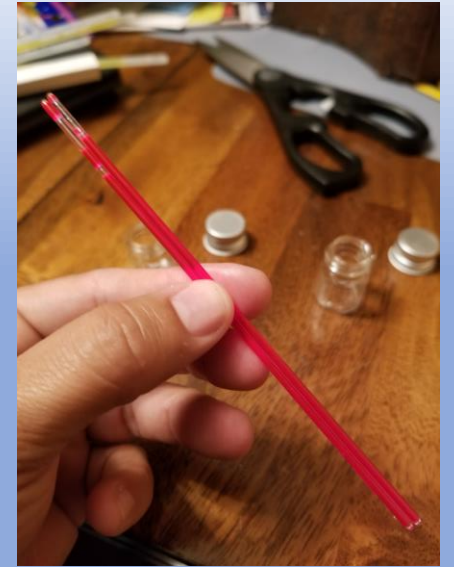
Next:

- **Carefully cut the tip of your glowstick. Do not bend or break your glowstick**
- **Pour the clear contents of the glow stick into one of your open vials**
 - **Be careful not to knock over your vial or spill the contents.**



Next:

- **You'll notice a glass tube with colorful liquid inside the glow stick.**
 - This has the second chemical you need.
- **Over a trashcan, carefully snip the tip of this vial with your Leatherman tool.**
- **Pour these contents into your second vial.**



Now for the fun part!

- **Get your last empty vial and take off the lid.**

- **Use 1 pipette to take out some of the clear liquid. This will represent **Luciferin**.**



- **Use 1 pipette to take out some of the colorful liquid. This will represent **Luciferase**.**

Now for the fun part!

- Squeeze your pipette with the clear liquid (**Luciferin**) into your empty vial.
- Squeeze your pipette with the colorful liquid (**Luciferase**) into the same vial.
- Put the lid on the vial and shake gently.
- Ta-Da you have the chemical reaction that has now made bioluminescence.

