Chemistry of Bioluminescence
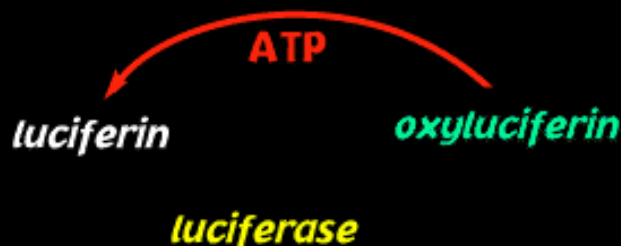
**Bioluminescence** is light produced by a chemical reaction within an organism.

At least two chemicals are required. The one which produces the light is generically called a "**luciferin**" and the one that drives or catalyzes the reaction is called a "**luciferase**."

The basic reaction follows the sequence illustrated above:

- The luciferase catalyzes the oxidation of luciferin
- Resulting in light and an inactive "oxyluciferin"
- To produce more luciferin, energy must be provided to the system, here shown as ATP.

Sometimes the luciferin and luciferase (as well as a co-factor such as oxygen) are bound together in a single unit called a "**photoprotein**." This molecule can be triggered to produce light when a particular type of ion is added to the system (frequently calcium).
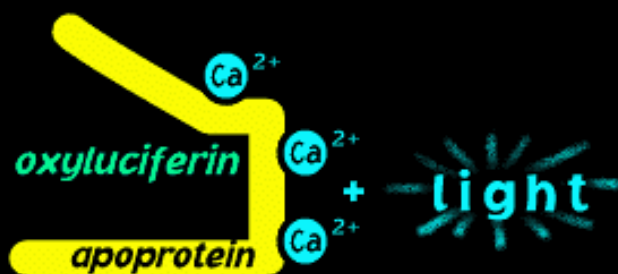
Bioluminescence is **not** the same as "fluorescence" or "phosphorescence". (See Myths for more explanation.) In fluorescence, energy from a source of light is absorbed and reëmitted as another photon. In bioluminescence or chemiluminescence the excitation energy is supplied by a chemical reaction rather than from a source of light.

Here is a simplified view of fluorescence:
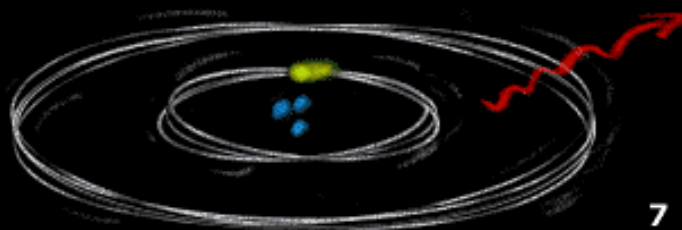
The mechanism of fluorescence (not bioluminescence)

1. An electron (yellow) orbits the nucleus (blue), minding its own business.
2. A source of light of an appropriate wavelength (indicating its energy) strikes ...
3. ...driving the electron into a higher-energy orbital.
4. The electron is only stable there for a short time whereupon it...
5. ...returns to the lower energy level...
6. ...emitting the energy as a longer wavelength photon.
7. The electron continues on its way...

Find out more about the molecules that make light.

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