

# Bioluminescence



Did you know some creatures can make light?

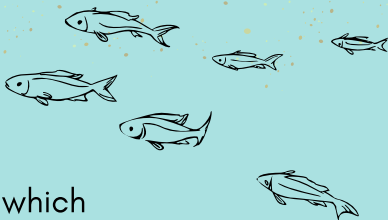
This super power is called **bioluminescence**.

Light is used to attract mates, catch food, camouflage, or scare off predators.



## Glowing Sucker Octopus

Some octopus have bioluminescent suckers, which could be used to attract **prey**.

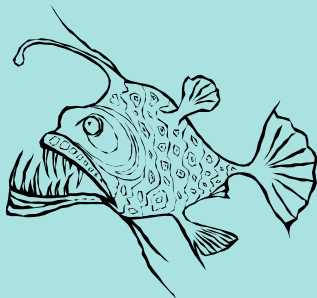


## Golden Sweeper

This fish does not light up on its own. It **eats** bioluminescent ostracods to get their glow!

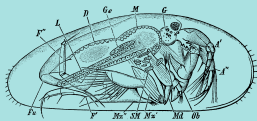
## Angler Fish

Famous for their dangling bioluminescent light used to **lure** prey!



## Hawaiian Bobtail Squid

Squid cannot make their own bioluminescence; instead, they get their shine by working with bioluminescent **bacteria**.



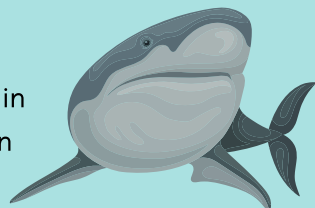
## Ostracods

These mini crustaceans are found in the ocean and use bioluminescence for **mating**.

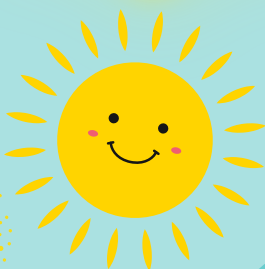


## Kitefin Shark

Uses bioluminescence to **hide** in the water so it can sneak up on prey and avoid predators!



# Light Power



I can make light too!



Every day we:



Eat

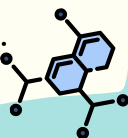


Sleep

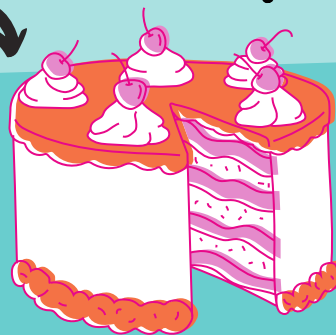
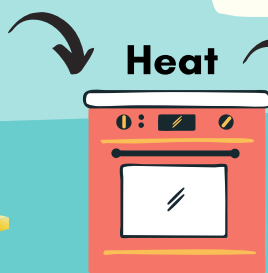


Exercise

These activities happen through **chemical reactions** in our body, which are carried out by molecules called **enzymes**.



For example, **baking** is a chemical reaction.



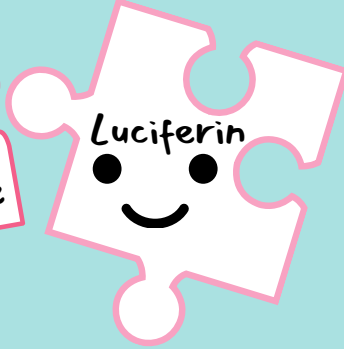
Heat (energy) tells enzymes to start chemical reactions, so ingredients in the batter **interact** and **change form** to bake into cake!.

Like baking, **bioluminescence** is a chemical reaction.

In fireflies, the bioluminescent reaction occurs in the **light organ**.

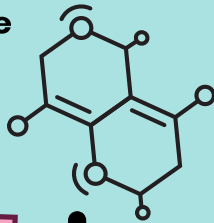


# The Light Team

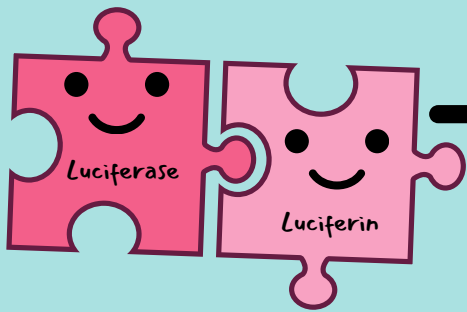


Enzymes cannot work alone!

To make light, **luciferase** pairs with its partner, **luciferin**.



Luciferase & luciferin are joined by their molecule friends **oxygen** and **magnesium**.



+

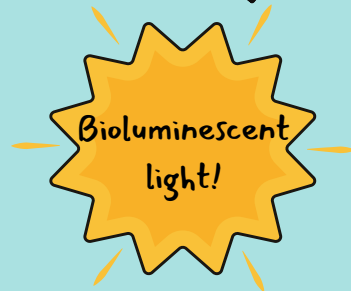


+



=

Fireflies emit flashes or glows of bioluminescence from their light organ to **communicate**.



Light organ



Fireflies can control their light signals by allowing **oxygen** in and out of the light organ! This allows them to emit light signals in specific **patterns**.

# References

Bessho-Uehara, M., Yamamoto, N., Shigenobu, S., Mori, H., Kuwata, K., & Oba, Y. (2020). Kleptoprotein bioluminescence: Parapriacanthus fish obtain luciferase from ostracod prey. *Science advances*, 6(2), eaax4942.

Ellis, E. A., & Oakley, T. H. (2016). High rates of species accumulation in animals with bioluminescent courtship displays. *Current Biology*, 26(14), 1916-1921.

Nyholm, S. V., & McFall-Ngai, M. J. (2021). A lasting symbiosis: how the Hawaiian bobtail squid finds and keeps its bioluminescent bacterial partner. *Nature Reviews Microbiology*, 1-14.

Claes, J. M., Nilsson, D. E., Straube, N., Collin, S. P., & Mallefet, J. (2014). Iso-luminance counterillumination drove bioluminescent shark radiation. *Scientific reports*, 4(1), 1-7.

Claes, J. M., Aksnes, D. L., & Mallefet, J. (2010). Phantom hunter of the fjords: camouflage by counterillumination in a shark (*Etmopterus spinax*). *Journal of Experimental Marine Biology and Ecology*, 388(1-2), 28-32.

Desjardin, D. E., Oliveira, A. G., & Stevani, C. V. (2008). Fungi bioluminescence revisited. *Photochemical & Photobiological Sciences*, 7(2), 170-182.

Wilson, T., & Hastings, J. W. (1998). Bioluminescence. *Annual review of cell and developmental biology*, 14(1), 197-230.

Johnsen, S., Balser, E. J., & Widder, E. A. (1999). Light-emitting suckers in an octopus. *Nature*, 398(6723), 113-114.

