

Bioluminescence and Environment

OVERVIEW

In these activities, students will understand how bioluminescence can benefit organisms that live in dark environments.

- **Before Your Visit:** Students will explore bioluminescent animals and their environments.
- **During Your Visit:** Students will observe bioluminescent animals and explore how their glowing body parts help them survive.
- **Back in the Classroom:** Students will share their findings and further explore how bioluminescence help animals survive.

NYS Science Core Curriculum

LE 5.1b: An organism's physical features can enable it to carry out life functions in its particular environment.

BACKGROUND FOR EDUCATOR

Bioluminescence — the chemical reaction that takes place in an organism and produces detectable light — can be particularly useful to animals that live in the dark. Scientists have observed organisms using bioluminescence in ways that include:

- Communication: signaling to mates
- Feeding: attracting prey with glowing body parts, making prey visible
- Self-defense: counter-illumination (camouflage), illuminating predators in order to attract animals that may attack those predators, startling predators, distracting predators, acting as a warning signal

BEFORE YOUR VISIT

Discussion: Bioluminescence

Have students look at images of bioluminescent organisms in their environments. (You can refer to the exhibition floor plan to help you select the organisms). Ask:

- What features do all of these environments share? (*Answer: darkness*)
- What are some of the challenges of living in the dark?
(*Answers may include: harder to find food, to find a mate, to communicate*)
- How might the ability to produce light benefit the organisms that live here?
(*Answers may include: might help them see better which would be helpful for feeding, mating, or outsmarting predators*)
- What might be some of the drawbacks of glowing?
(*Answers may include: you are making it easier for others to see you, which may attract predators*)

Plan how your students will explore *Creatures of Light*. Since the exhibition will be dark, we recommend that you and/or your chaperones use the guided explorations in *Teaching in the Exhibition* to guide your students through the exhibition.

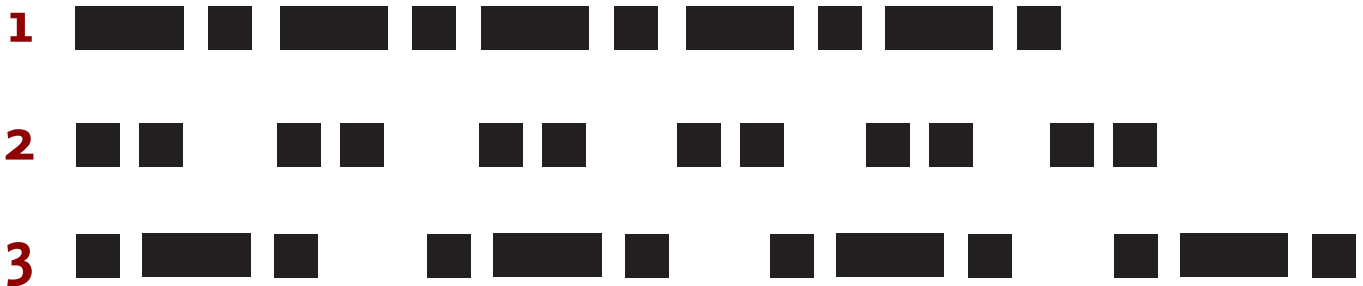
Before your visit, distribute copies of the **worksheets** to students and review them together. Tell students that they will be filling in the worksheets *after* the exhibition.

Activity: Communication: Fireflies

Students will try to communicate with flash patterns that resemble those used by fireflies.

Materials: Flashlights, Flashcards with pictures of different fireflies and their coding sequences (indicate the top of the card)

Divide your class into six or nine groups and give each group a flashlight and flashcard with one of the codes provided here. There must be at least 2 groups with each code.



Explain that:

- each group's code will match up with one other group's (their "mate")
- a dot indicates a short flash and a dash indicates a long flash (demonstrate)

Give each group a few minutes to practice their codes.

Then give the groups five minutes to try and find their mates using only their flashlight codes. Afterwards, discuss the challenges of communicating only with light. Ask:

- Why did some groups succeed and others not? (Answers may include: its easier to find each other if you are close by or there isn't a lot of light interference, the simpler the signal, the easier it is to spot it)
- What made it hard to communicate? (Answers may include: hard to understand the signal with so many others signaling at the same time, hard to tell if the flash was long or short)

DURING YOUR VISIT***Creatures of Light: Nature's Bioluminescence***

3rd floor (45 minutes)

Before entering, remind students that they should be on the lookout for which bioluminescent organism they might like to focus on. Refer to the guided explorations found in the Teaching in the Exhibition section of this guide as you progress through the exhibition.

Milstein Hall of Ocean Life

1st floor (20-30 minutes)

Have students visit the Deep Sea Ecosystem on the upper level of the hall. Break students into groups and have them discuss how bioluminescence helps different animals survive. Ask them to note similarities and differences between organisms, and write down their observations. Students may also want to think about the challenges that that an organism would face if it weren't bioluminescent. Have students complete both sections of their worksheets here.

BACK IN THE CLASSROOM

Activity: Create a Classroom Mural of Bioluminescent Creatures

Have students give a short presentation on one of the bioluminescent organisms that they learned about at the Museum. Have them include information about its habitat, why bioluminescence is useful in that environment, what color it displays, and how bioluminescence helps it survive. You may want to assign students interested in the same animal to work in teams. Afterwards, students can use the presentations to create a classroom mural.

Activity: How Does the Stoplight Loosejaw Dragonfish Spot Prey?

In this activity, students will look through different colored lenses to see if it confers an advantage in spotting prey. (The stoplight loosejaw dragonfish uses its pulsing red light — the “stoplight” — to spot a red shrimp, then catches the shrimp in its oversized and extendable “loose” jaw. Since this fish is almost the only deep-sea animal to both produce and see red light, it spies the shrimp. But the shrimp can’t detect the fish’s red light... so it gets eaten!)

Materials:

- Sheets of blue- and red-tinted plastic
- Hole punch
- Red, blue, and black construction paper (one sheet each of red and blue paper, two black sheets)

Using the hole punch to make five sets of colored dots (20 each in blue, red, and black). Scatter all the dots on a square yard of black material and have students take turns as predators. Each predator gets 15 seconds to pick up dots, one at a time. As:

- How many dots did each predator collect?
- Which color dot was captured most often? Why do you think that was?

Repeat the activity, this time with one predator looking through red-tinted plastic, another looking through blue-tinted plastic and the third using no filter. Compare and discuss the results.

Activity: How Does the Hatchetfish Defend Itself?

In this activity, students will see what challenges this method of camouflage creates for predators. (The hatchetfish adjusts the light on the rows of light organs on the underside of its body to blend in with the faint light from above. This helps to hide it from predators lurking below.)

Materials:

- Wrapping paper with a two-colored pattern
- Plain wrapping paper (1 roll in each of the colors that match the colors in the pattern)
- Scissors
- Tape

Cut a large sheet of the patterned paper; this will be the “environment.” Cut 10 fish shapes out of each of the 3 types of paper. Attach the fish to the “environment,” matching its shape to the background as well as possible.

Attach this to the wall of your classroom. Break the classroom into two groups and give each group 15 seconds to “hunt” in the habitat. (Have them stand a few feet away).

After the hunt, ask:

- How many fish did your group find?
- What color fish did you find the most of?
- Was it harder to find the patterned fish? Why?

Student Worksheet

Use this sheet to record your observations about some of the bioluminescent animals that you saw in the Museum today.

Pick a bioluminescent animal from the *Creatures of Light* exhibition.

Draw it here.

What is the animal's name?

What part of its body lights up?

How does bioluminescence help the animal?

Why would it be harder for the animal to survive if it weren't bioluminescent?

Pick the bioluminescent animal from the Deep Sea Ecosystem in the Milstein Hall of Ocean Life.

Draw it here.

What is the animal's name?

What part of its body lights up?

How does bioluminescence help the animal?

Why would it be harder for the animal to survive if it weren't bioluminescent?