

# Color Vision

GRADE LEVELS	K-2 <sup>nd</sup> ; Standards for K-2 <sup>nd</sup>
SUBJECTS	Life Sciences
DURATION	Preparation: 20 minutes    Activity: 30 minutes
SETTING	Color of Life Exhibit

## OBJECTIVES

Through this scavenger hunt, students will:

1. learn how color and patterns in nature help animals camouflage in their surroundings.
2. become aware of how some animals can see colors that we human cannot.
3. develop observation skills by looking closely for patterns and details.

## MATERIALS

- Color Vision scavenger hunt (one copy per chaperone)
- Clipboards (one per chaperone, optional)
- Pencils (one per chaperone, optional)

**Note:** This activity is purposefully designed to be facilitated by chaperones rather than completed by students with pencils. By having adults focus on the reading, your young students can better explore the exhibits.

## SCIENTIFIC TERMS FOR STUDENTS

- Camouflage: colors or patterns that help animals blend in with their surroundings
- Vision: the ability to see

## BACKGROUND FOR EDUCATORS

There are 5 major themes in the Color of Life exhibit: Color Sources, Animal Vision, Color Communicates, Color Conceals, and Color Cues. This scavenger hunt focuses on the Color Conceals and Animal Vision sections. Students are encouraged to explore the remaining of the exhibit and museum using the observational skills they learned from this activity.

### *Color Conceals*

Camouflage in nature allows some animals to hide in their habitats through the use of colors and patterns. This is critical for survival whether it is to protect themselves from predators or to diminish suspicion while attacking their prey (PBS, 2001). There are several forms of color concealments.

- Concealing coloration or background matching is when animals hide against background of the same color. Students will see this when they try to find the Malaysian Leaf Insects.

- Disruptive coloration is when patterns such as spots, or stripes on the animals break up their outline so they do not stick out against the background. Students will see this when looking at the giraffes and tiger.
- Disguise is when the entire animals look like another object that can easily be overlooked. Students will see this when they try to find the Malaysian Leaf Insects.

### *Animal Vision*

It is crucial to understand what and how an animal really sees to understand its behavior. Scientists study color receptors, or cones, and the number of cones an animal eye contains to understand the colors the animals can see. For example, humans generally have three cones (red, green, and blue cones), which allow us to see colors from violet to red. However, other animals may have a different number of cones, which allow them to see things that we may not see.

- **Birds:** Birds and most reptiles that are active by day have one additional cone than humans, which gives them the ability to detect light that is ultraviolet (UV). UV is a color that occurs in wavelengths shorter than what humans can see (Berger, 2012). This is useful for mate selection and hunting. Many species of birds have color differences between male and females, which are seen or enhanced by UV light. Birds are able to use UV light to forage for fruits, insects, or rodents.
- **Bees:** Bees have cones that sense blue, green and ultraviolet. Many plants that are pollinated by bees have flowers that reflects these colors (Burnett, 2011). Ultraviolet-colored targets help direct bees to plants that need to be pollinated. The target shape is important because bee vision is slightly blurry due to their compound eyes.
- **Snakes:** It has been shown that snakes have several cones, which are sensitive to colors we can see. Additionally some snakes, such as vipers, pythons, and boas, have holes in front of their eyes called pit organs (Goris, 2011). These pits allow snakes to see infrared. Infrared is a color with a wavelength longer than what humans can see. This is a helpful color to see because animals that are warmer than their surroundings, such as rodents, give off infrared radiation as heat which enable snakes to use "heat vision" to "see" their prey or predators.

## EDUCATOR PREP

1. Consider visiting the Academy before your field trip to try out the scavenger hunt yourself. You can receive free admission when you bring a copy of your reservation to the Academy's ticket window.
2. After determining the number of chaperones, split your class into small group accordingly and assign at least one chaperone to one group. Assign groups to the parts of the exhibit where they will start.

3. Make copies of the scavenger hunt for each chaperone. Consider giving each adult a clipboard. Pencils are optional if chaperones want to take notes or keep track of their progress.
4. Go over the scavenger hunt with your adult chaperones ahead of time and make sure they are familiar with the activity.
5. This scavenger hunt is split between two parts of the Color of Life exhibit as indicated on the maps. Half of the groups may want to start in each part in order to prevent crowding. Consider assigning chaperones to specific starting locations.

## BEFORE YOUR VISIT

1. Explain to your students that the field trip to the California Academy of Sciences will include a scavenger hunt at the Color of Life exhibit to learn about color in nature. The students will be in small groups led by their chaperones. During the activity, their chaperones will have a list of animals for the students to find.
2. Introduce the concept of vision and camouflage to your students. Encourage your students to brainstorm ideas about color in nature. You may use pictures or books to get students thinking about this in more specific ways. You can ask questions such as the following:
  - Let's make a list of animals that are in each color of the rainbow.
  - Has there ever been a time when an animal surprised you because you didn't see it at first?
  - What animals tend to blend in with their surroundings?
  - Why do you think some animals blend into their surroundings?
  - Do you think animals see in the same way that we humans see?
3. Make a KWL chart on the board. After you do the following introductory activities, fill in the list for "What we know" about camouflage and vision. Then make a list of questions that they have in the "What we want to know" section. The section on "What we learned" will be filled out after the field trip.

K What we <i>know</i>	W What we <i>want to know</i>	L What we <i>learned</i>

4. Tell the students - let's think about camouflage. Ask your students to close their eyes and imagine themselves looking at a lion. What do they notice on the lion? What do they notice about the environment the lion is living? Where might it go to hide, or sneak up on a prey? Where would the lion go if they are hungry?

5. The other topic we will explore is vision. Vision is the way an animal sees. Imagine you are an eagle. What do eagles see? Where do they look to find prey? Do students think eagle eyes see differently or the same as human eyes?
6. At the exhibit we will learn more about these and see what color and vision might mean in nature.

## DURING THE FIELD TRIP

1. Remind chaperones to use the guiding questions rather than giving the students answers. Do not be afraid of silence, instead urge students to spend several seconds to think things over. Everyone will try to discover together.
2. Designate a time to meet back up, allow at least 30 minutes to complete the scavenger hunt. Encourage the groups to explore the rest of the exhibit after the hunt.

## WRAP-UP

1. Once the scavenger hunt is complete, bring your students together either at the museum or back in the classroom.
2. Show the KWL chart that you started before the field trip. What can be added to the "Learned" column? What is something new they learned about camouflage and vision from the visit?
3. Ask the students to share a few things they discovered from their "I spy..." activity.
4. Consider having your students reimagine themselves as being a lion and an eagle. What do they see differently now?
5. Conclude the sharing with their new perspectives with the following guiding questions:
  - What do they think the importance of the animals being able to blend into their surroundings?
  - What is similar and what is different between how we see, and the animal sees?

## EXTENSIONS

After your visit you could visit your schoolyard or garden to explore what animals are camouflaged there. Or, to draw a representation of how an animal such as a bee might see that area.

## REFERENCES

PBS (2001). Evolution of Camouflage. Retrieved August 10, 2015 from [http://www.pbs.org/wgbh/evolution/library/01/1/I\\_011\\_03.html](http://www.pbs.org/wgbh/evolution/library/01/1/I_011_03.html)

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Burnett, S. (2011). Perceptual Worlds and Sensory Ecology. *Nature Education Knowledge*, 3(10), 75. Retrieved August 10, 2015 from <http://www.nature.com/scitable/knowledge/library/perceptual-worlds-and-sensory-ecology-22141730>

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### NEXT GENERATION SCIENCE STANDARDS

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none"> <li>• <b>Analyzing and Interpreting Data</b> Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions.</li> <li>• <b>Constructing Explanations and Designing Solutions</b> Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>LS1.A: Structure and Function</b> All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.</li> <li>• <b>LS1.D: Information Processing</b> Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Patterns</b> Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.</li> <li>• <b>Structures and Function</b> The shape and stability of structures of natural and designed objects are related to their function(s).</li> </ul>

### Related Performance Expectations

- 1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

## CALIFORNIA SCIENCE CONTENT STANDARDS

### Kindergarten

#### Life Sciences

2a. Students know how to observe and describe similarities and differences in the appearance and behavior of plants and animals (e.g., seed-bearing plants, birds, fish, insects).

### Grade One

#### Life Sciences

2a. Students know different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.

### Grade Two

#### Life Sciences

2c. Students know many characteristics of an organism are inherited from the parents. Some characteristics are caused or influenced by the environment.

