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Bee Perception Lab

Objectives

To learn about how bees see flowers and the world in which they exist and some tricks that flowers use to attract pollinators

Topics Addressed

Flower morphology, Bee Physiology

Background

A flower is the reproductive structure of a plant, and in order for most plants to successfully reproduce, they must enlist the help of an animal pollinator. One of the ways plants attract pollinators is through the use of color. Many flowers that are red attract hummingbirds, for example, while flowers that attract moths are white so they are visible at night. Flowers that attract bees usually have bright colors, such as yellow, blue, or pink.

However the way bees perceive the world is not necessarily the same as the way we see it. Bees have compound eyes and can perceive different colors (color vision) like we do, but can also perceive ultraviolet light. Pigments in flower petals which absorb or reflect UV light create patterns visible to bees that are not visible to humans. These are sometimes referred to as "guides" that serve to direct pollinators toward the nectar, and therefore, pollen.

Background Questions:

1. Do all people perceive color the same way? Explain?

2. Why do you think flowers have pollen guides that are only visible to certain species like bees, but not others?

Procedure

- 1. Collect a variety of flowers to photograph. Try to get a variety of different colors, shapes, and sizes.
- 2. Take a picture of each flower under normal lighting. You may need to experiment with distance and focus in order to get a good image.
- 3. After you have a good photo of the flower in visible light, move the flower into UV lighting. The area around the flower must be dark, except for the UV light.
- 4. Photograph the flower until you get a good image. It may take a little work to get a good picture in the UV light.
- 5. Compare the original pictures with the UV pictures to see if there are any differences between how we see the flower and how bees see it.

Images

Pick your best images, and upload the visible light and UV light versions of what the flowers look like.

Analysis Questions

1. What are some of the ways that the flowers look different under UV light? (Describe for each flower you photographed)

2. How do you think the UV markings work? From what you saw, how do you think they would help the plant get pollinated?

- 3. Were there some flowers that did not have any significant markings in the UV light? Why do you think they didn't?
- 4. Were the UV "guides" more towards the center or more towards the outer parts of the flowers? Why do you think they are there?
- 5. Do you think any other parts of the plant (such as leaves or stems) would have UV markings/guides? Why or why not?
- 6. Why do you think bees and other insects have adapted to be able to see UV light? What advantage does it give them?

Teacher Notes

Approximate time: Can be done as a 1 day or 2-day lab.

Materials needed:

- UV flashlight, or
- Lamp with UV bulb (inexpensive, can be purchased at Home Depot or other hardware stores).
- Dark setting for UV photography. A darkroom or space that can be completely darkened is ideal, but this can be as simple as a large cardboard box with a side cut out for inserting the phone, and a black cloth attached to the side.

Notes

- You may want to collect or purchase flowers before class if you do not have time for collection during the class period. Student collection will allow for more variety. Dandelions are an excellent species to start with since they are so common and show a distinct "bullseye" pattern in the middle.
- It is not necessary, but having students upload their UV images to a shared folder, such as Google Drive or Dropbox is a good way to see what they were able to photograph.