Interactive Video Conferencing

CLEVELAND MUSEUM OF NATURAL HISTORY

TEACHER GUIDE

Science of Seeking Snacks: *Learn About Your 5 Senses With 6-Legged Specimens!*

60 Minute Life Science Lesson
Interactive Video Conference
Grades: 3 - 7

Science of Seeking Snacks: Learn About Your 5 Senses With 6-Legged Specimens

Description

The smell of fresh-baked cookies. The look of bright red strawberries. What lures YOU to seek a snack? Join this real-life investigation of how praying mantis hunting behavior gives us insights into our own eating habits. Compare insect and human senses, and see amazing scanning microscope images of insects' sensory organs -- taken in our own Entomology lab. Examine insect specimens used at the Ritzmann Lab with Case Western Reserve University—and hear their brain activity! This program will take you beyond the basic 5 senses with the help of 6-legged scientists!

Objectives

- Compare and contrast the body structures and senses of insects with the bodies and senses of other animals, including ourselves
- Describe two or more adaptations of structures and body parts that help insects survive in different environments
- List ways that insects and mammals must adapt to biotic and abiotic factors in their environment
- Identify hormones that serve as chemical signals for both a praying mantis and a human being

Ohio's Learning Standards

Grade 3: Life Science - Behavior, Growth and Changes
- Plants and animals have life cycles that are part of their adaptations for survival in their natural environments.

Grade 4: Life Science - Earth's Living History
- Changes in an organism's environment are sometimes beneficial to its survival and sometimes harmful.

Grade 5: Life Science - Interconnections within Ecosystems
- Organisms perform a variety of roles in an ecosystem.
- All of the processes that take place within organisms require energy.

Grade 6: Life Science – Cellular to Multicellular
- Living systems at all levels of organization demonstrate the complementary nature of structure and function.

Grade 7: Life Science – Cycles of Matter and Flow of Energy
- In any particular biome, the number, growth and survival of organisms and populations depend on biotic and abiotic factors.

Funding provided by the National Science Foundation

Developed in partnership with the Ritzmann Lab at Case Western Reserve University Est. 1826

How You Can Help Us Make This Virtual Program A Success

Let your students see the research behind this program! Go here: https://www.cmnh.org/ivc

and watch our video filmed at the Ritzmann Lab of Case Western Reserve University.
The video is posted with the description of this program.

- If your students are joining us from your classroom computer, please arrange your room and projection screen so everyone can see us clearly.
- If you and your students are joining us from your homes, we will have an educator monitoring the Chat feature for questions. We request that you or another staff person serve as a Co-Host to help monitor students for any inappropriate Chat or camera behavior.
- If you will have a hybrid class (some at school, some joining from home), our educator will monitor the Chat and camera behavior, and we reserve the right to temporarily move any disruptive students to our Waiting Room so we or school staff can correct the undesired behavior.
- If you prefer, we can turn off all cameras and interact solely via the Chat feature.

Vocabulary

abdomen - the rear segment of the three divisions of an insect's body

adaptation - things an organism has to help it survive

antennae - (singular - **antenna**) a pair of sensory structures located on an insect's head

arachnids - the group of arthropods that includes spiders, scorpions, ticks and mites. They are not insects since their bodies have two main parts, eight legs and no antennae.

arthropod - a segmented animal with a jointed exoskeleton and jointed legs

camouflage - coloration of an animal that allows it to blend in with its surroundings

cornea – transparent layer forming the front of an eye. Insects have compound eyes, with each separate tiny ommatidium having its own cornea.

egg - the structure laid by most female insects in which the embryo develops

entomologist - a scientist who studies insects and certain other arthropods, such as ticks and mites

exoskeleton - the external, protective body covering of insects, spiders and other invertebrates that support the internal organs and muscles

fat body – a tissue found in insects that stores and releases energy as glycogen and triglycerides. This storage and release is very important during growth and times when food is scarce. It is analogous to the mammalian liver and pancreas.

ghrelin – often referred to as "the hunger hormone". When the stomach is empty, ghrelin is secreted. When the stomach is stretched, secretion stops. It acts on hypothalamic brain cells both to increase hunger, and to increase gastric acid secretion and gastrointestinal muscle movement to prepare the body for food intake.

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glucagon - a hormone formed in the pancreas that promotes the breakdown of glycogen to glucose in the liver. This causes blood sugar levels to rise, the opposite effect of insulin.

glycogen – a substance made from glucose that's stored in your liver and muscle cells to be used later for energy.

hemolymph – a fluid equivalent to blood in most invertebrates.

hypothalamus – a small part of the bottom center of the brain. It regulates body temperature, hunger, thirst, fatigue, sleep, and other behaviors.

insect - an invertebrate animal with an exoskeleton, whose body is divided into three sections (head, thorax, abdomen), has six jointed legs and a pair of antennae

insecticide - chemicals used to kill insects

insulin - a hormone made by the pancreas that allows your body to use **sugar** (glucose) from carbohydrates in the food that you eat for energy. This causes blood sugar levels to drop.

Insulin-like peptide – (ILP) chemicals made by insects that have similar functions to mammals' hormones insulin and glucagon

invertebrate - an animal without a backbone

larva - (plural - **larvae**) the growing stage in an insect's life cycle, between egg and pupa

leptin - the "satiety hormone", is a hormone made by adipose (fat) cells that helps to regulate energy balance by inhibiting hunger. Acts in opposition to the hormone ghrelin. Leptin acts on specific cells in the hypothalamus.

life cycle - all of the stages in an insect's life. Begins when the adults mate and lay eggs; the eggs hatch and the young insect feeds, grows and metamorphoses into an adult which will then find a mate.

metamorphosis - the series of changes of physical form an insect undergoes as it passes from egg to adult. There are two main types of metamorphosis: **complete** metamorphosis has four distinct stages--egg, larva, pupa and adult. **Incomplete** metamorphosis has three main stages--egg, nymph and adult.

ommatidia – (AH-mah-tid-ee-ah) compound eyes of arthropods like insects, crustaceans and millipedes are made up of many units called ommatidia. Each one is covered by a cornea, and has a bunch of light-sensitive cells, pigment cells, and some nerves that send incoming information to the brain.

pancreas - a large gland behind the stomach in mammals that secretes digestive enzymes into the first section of the small intestine. Embedded in the pancreas are the *islets of Langerhans*, which secrete into the blood the hormones insulin and glucagon. Insects do not have a pancreas; see *fat body.*

peptide – a compound made of two or more amino acids linked in a chain. Many hormones and antibiotics are peptides.

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praying mantis - a slender predatory insect related to the cockroach. Some species wait motionless for prey with their large spiky forelegs folded like hands in prayer, while others actively chase and pounce on other insects. The Carolina mantis (*Stagmomantis carolina*) is native to Ohio, while two other species, *Tenodera sinensis* and *Mantis religiosa*, were introduced to the US in the 1800s and are now also common in Ohio.

pseudopupil – dark spot in the compound eye of an invertebrate that seems to move across the eye when the animal is rotated. This happens because each single ommatidium absorbs direct light, but reflects indirect light.

pupa - (plural - **pupae**) the transformation stage in many insects' lives between the larval and adult stages

satiety (say-TIE-ah-tee) – the feeling or state of being full of food (not hungry).

thorax - the middle section of an insect's body between the head and the abdomen. Legs and wings of insects are attached to this segment.

triglycerides - a type of fat (lipid) found in the blood

tymbal - In male cicadas, the tymbals are membranes in the abdomen that are rapidly vibrated to produce very loud calls.

tympanum – the hearing organ in insects

vertebrate - an animal with a backbone

Extension Activities: Students 2nd -5th grades

1. Bring live insects into the classroom! Crickets and mealworms can be purchased at pet shops. They are safe and easy to care for. If mealworms are refrigerated they will not undergo metamorphosis as rapidly. Use your insect friends to study the stages of an insect's life cycle (complete or incomplete metamorphosis).
2. Have a beekeeper, an entomologist from a museum or agricultural extension agency, or an insect keeper at a zoo come to your classroom to talk about insects. Many of our food crops rely on insects for pollination.
3. Fill the classroom with photographs of insects. Have students notice that insects can be brightly colored or camouflaged. Make insects out of construction paper, pipe cleaners and other doo-dads. Remember that insects have three body parts, six legs (attached to the thorax) and a pair of antennae.
4. Play insect sounds and help students identify the sounds. Practice your knowledge of insect sounds by going outdoors to listen, then look for the noisemaker.
5. Insects are food for many animals and some plants, including the sundew, pitcher plant and Venus fly-trap. Have students find photographs of animals that eat insects. In many parts of the world, insects are a regular food item for people. If your school allows it, you can purchase cooked, edible insects from many online stores. *NOTE:* If a person is allergic to shellfish (shrimp, crab, lobster, crawdads), then they may also have an allergic reaction to eating insects.

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6. Have students research plants that can be grown in a butterfly or insect garden on the school grounds. An easy way is to allow “weeds” to grow up and have the insects feed on these, or plant specific plants as food for larvae or for nectar for adults.

Extension Activities: Students 6th -7th grades

1. Check out the insect research going on at the Ritzmann Lab at Case Western Reserve University: http://biology.case.edu/faculty/roy-ritzmann/ There are some videos of insects in action!
2. Also visit Dr. Gavin Svenson’s website to see more mantis studies: https://mantodearesearch.com/
3. Investigate the works of these scientists who happen to also be comic-book authors with a strong appreciation for insects and the natural world:
   a. http://www.jayhosler.com/
   b. http://www.daybiomed.com/

Online Resources for Teachers and Students

Click the link below to find additional online resources. These websites are recommended by our Museum Educators and provide additional content information.

CMNH Educators regularly review these links for quality. Web addresses often change so please notify us if any links have issues. Please note that aside from our own Museum website, the Museum is not affiliated with and does not endorse these online resources.

Cleveland Museum of Natural History https://www.cmnh.org/edlinks

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