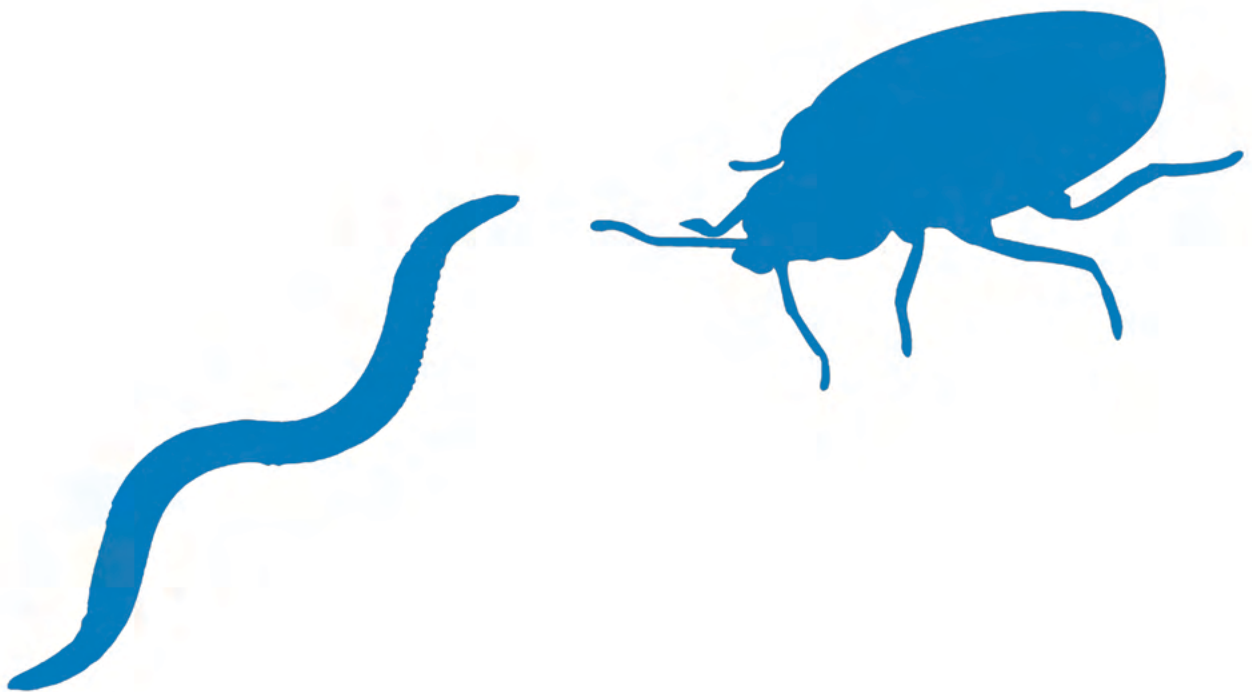


Crawly Critters



Invertebrates Vol. 2 Wonder Workbook



Image Investigator

Summary: Students observe an image and create an accompanying story to construct an explanation as to what might be going on in the image.

Grade Range (suggested): K-5

Materials:

- An image or video
- Image Investigator worksheet



ENGAGE

1. Tell students that today we will be looking at an image/video to try to understand what might be happening in it, and uncover the story that it is telling.

PREPARE TO EXPLORE

2. Introduce the image/video you will be looking at. Ask students to look closely at the image for a minute or two or watch the video once or twice.

EXPLORE

3. Once students have had a minute to look at the image or watch the video, ask them “What is going on here?” The goal of this activity is to guide your student’s thinking and understanding as to what is going on in the image/video. Avoid inserting information--let students look closely and reason out their responses, rather than by discussing the facts.
4. Follow up the first question with, “What do you see that makes you say that?” to encourage students to back up their explanation with evidence from the image. This step can be repeated many times, having students build on their own ideas.
5. When a train of thought comes to an end, ask “What more can we find?” to pull out more evidence or to continue to build the explanation.

REFLECT and SHARE

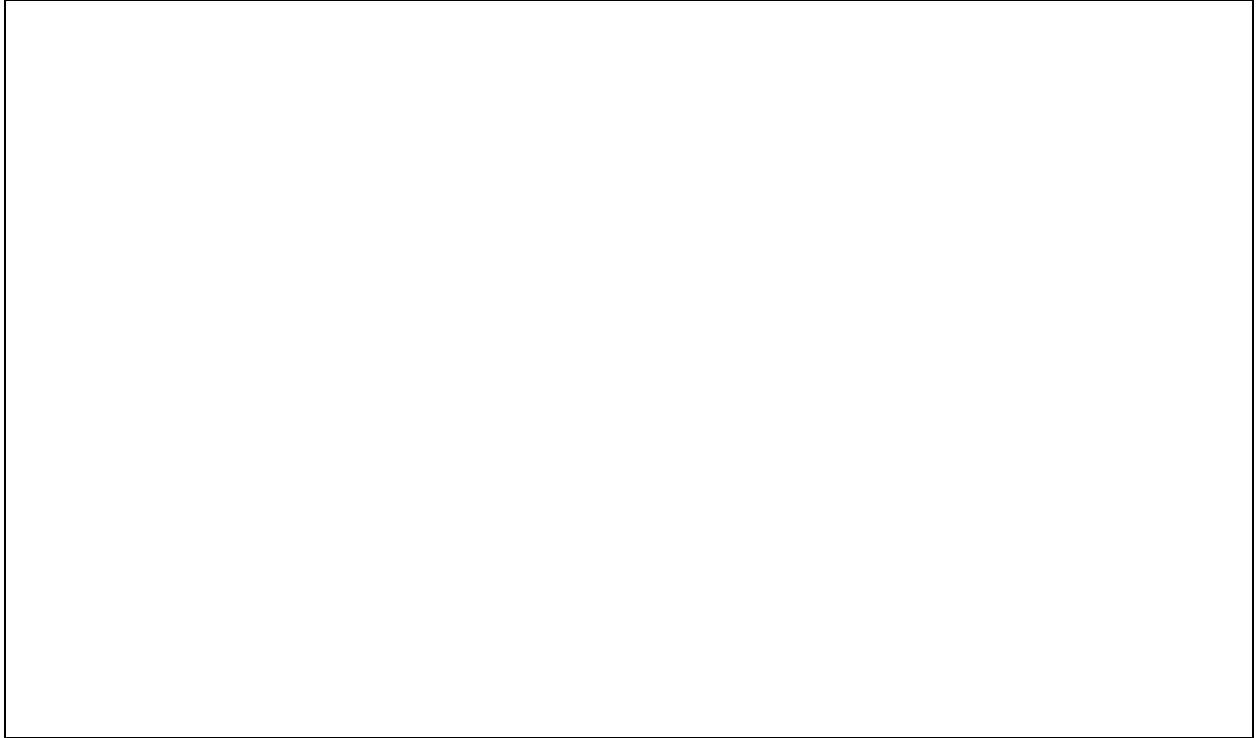
6. Now that your students have thought about the image/video and what might be going on, have them write a story that explains it using the worksheet. They can use words and/or pictures to tell their story.
7. Have students share their story with someone!

Extensions and Variations:

- Use the same graphic organizer, but look at a different image or video. It could be related to any content!
- Take all of the stories your class creates and put them together in a book to share!

Image Investigator

Use words and/or pictures to tell a story about what you observed.



Investigador de imagen

Resumen: Los estudiantes observan una imagen y crean una historia que la acompaña para construir una explicación de lo que podría estar pasando en la imagen.

Rango de grado escolar (sugerido): K-5

Materiales:

- Una imagen o video
- Hoja de trabajo del Investigador de Imágenes



Engranar:

1. Diga a los estudiantes que hoy veremos una imagen / video para tratar de comprender lo que podría estar sucediendo en él y descubrir la historia que está contando.

Preparar para explorar:

2. Presente la imagen / video que estará viendo. Pida a los alumnos que observen detenidamente la imagen durante un minuto o dos o que vean el video una o dos veces.

Explorar:

3. Una vez que los estudiantes hayan tenido un minuto para mirar la imagen o ver el video, pregúnteles "¿Qué está pasando aquí?" El objetivo de esta actividad es guiar el pensamiento y la comprensión de su estudiante sobre lo que está sucediendo en la imagen / video. Evite insertar información: permita que los alumnos observen detenidamente y razonen sus respuestas, en lugar de discutir los hechos.
4. Siga la primera pregunta con: "¿Qué ves que te hace decir eso?" para alentar a los estudiantes a respaldar su explicación con evidencia de la imagen. Este paso puede repetirse muchas veces, haciendo que los estudiantes desarrollen sus propias ideas.
5. Cuando un tren de pensamiento llega a su fin, pregunte "¿Qué más podemos encontrar?" para sacar más evidencia o continuar construyendo la explicación.

Reflexionar y Compartir:

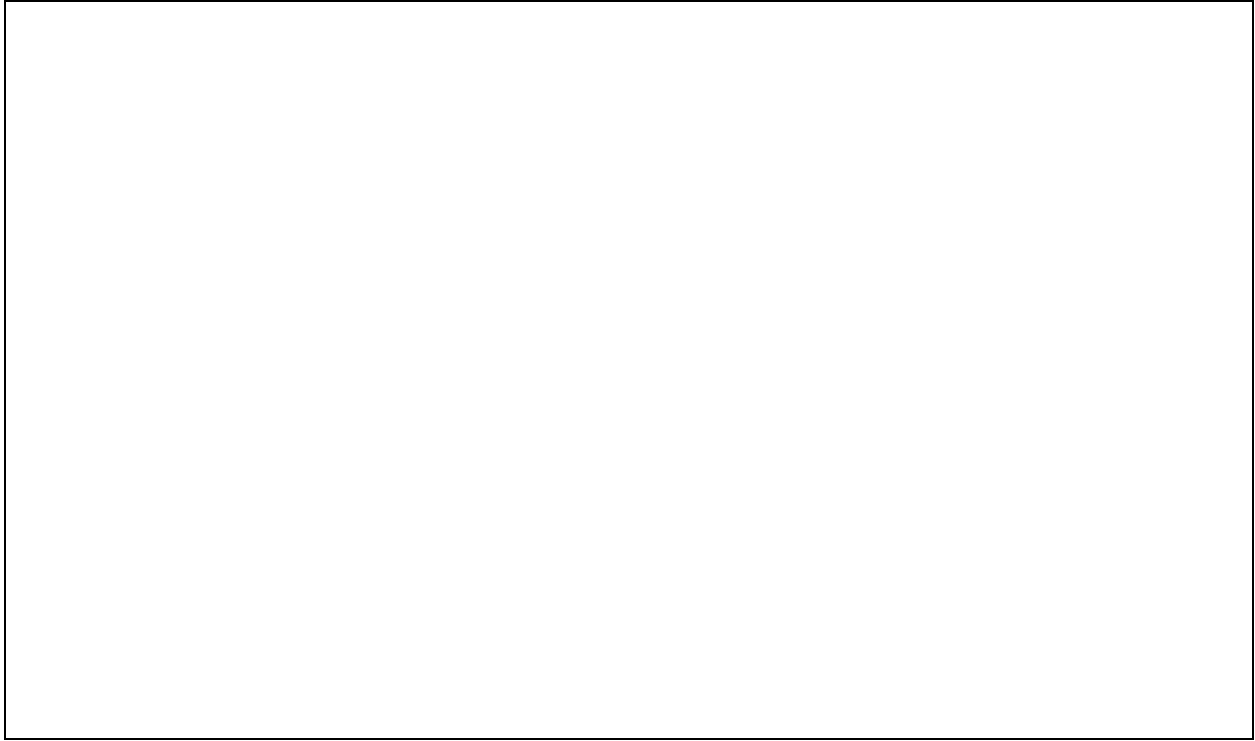
6. Ahora que sus alumnos han pensado en la imagen / video y lo que podría estar pasando, pídale que escriban una historia que lo explique usando la hoja de trabajo. Pueden usar palabras y / o imágenes para contar su historia.
7. ¡Haga que los estudiantes compartan su historia con alguien!

Extensions and Variations:

- Utiliza el mismo organizador gráfico, pero mira una imagen o video diferente. ¡Podría estar relacionado con cualquier contenido!
- ¡Tome todas las historias que crea su clase y compártalas en un libro para compartir!

Investigador de imagen:

Use palabras y / o dibujos para contar una historia sobre lo que observó.



Drawing from the Museum's Collections



Draw/Label:

Use pictures and words to show what you notice about **ONE** of the specimens on this page.

Think:

What can you learn about this organism from observing the specimen?

What questions do you have about this specimen?

Dibuja de la Colección del Museo



Dibuja/Etiqueta:

Usa dibujos y palabras para mostrar lo que notas sobre **UN** espécimen en esta página.

Piensa:

¿Qué puedes aprender sobre este organismo al observar la muestra?

¿Cuáles preguntas tienes sobre este espécimen?

Insect Song

To the tune of Head, Shoulders, Knees and Toes

Head (*point to head*)

Thorax (*point to shoulders*)

Abdomen, Abdomen (*point to stomach*)

(Repeat 2 times)

Compound Eyes and Mouth (*point to eyes and mouth*)

6 Legs and Sometimes Wings

(*wiggle 6 fingers and flap arms like wings*)

Head, Thorax, Abdomen, Abdomen!

Curious Questions, Small Bugs, Big Answers

We often get great questions about insects during our programs based on their observations of these small creatures. We took the chance to ask Allen, our entomologist, to answer some frequently asked questions about insect bodies.

Do insects have blood?

In a sense they do, but it is quite different from human blood. Insects have an open circulatory system, which means their “blood” does not flow through vessels like veins and arteries. Their body cavities are filled with a fluid called hemolymph which is moved through the body by contracting their muscles and through the dorsal vessel along their backs which functions like a heart. Hemolymph, like blood, plays a role in storing and transporting nutrients, hormones, and immune system cells throughout the body. Unlike blood, hemolymph does not contain red blood cells or oxygen carrying hemoglobin. Instead, insects breathe through a set of branching tubes called tracheae. The tracheae open to the outside at pores along the sides of an insect known as spiracles and branch out to reach every cell within the body.

If insects don’t have a skeleton how do they move?

To answer this question, we need to first clarify that insects do have a skeleton. They do not have an internal skeleton like we do, known as an endoskeleton. Rather, the outside of their bodies is their skeleton, an exoskeleton. Insect cuticle contains chitin, long chains of glucose molecules which when crosslinked provide rigidity allowing it to function as an exoskeleton. It turns out that insect exoskeletons play a similar role in movement as our endoskeletons do. Both kinds of skeletons have ridges or other structures for muscles to attach to. Insects move by contracting opposing muscles attached to their skeletons just like we do, the difference being the muscles are attached on the inside of their skeletons rather than the outside.



Caption: The dorsal vessel is visible in these freshly hatched Madagascar hissing cockroaches (*Gromphadorhina portentosa*). Over time the cuticle will tan and stiffen as crosslinks form between chitin molecules.

How many wings can an insect have?

Insects can have up to two pairs of wings, so four in total. Not all insects have wings and those that do only have them in their final adult life stage, except for mayflies which have two adult stages. Knowing that, notice any inaccuracies with the “Baby Bumble Bee” song? A baby bumble bee does not have a stinger or wings, they are just little white grubs! Some groups of insects never have wings, even as adults, like silverfish and fleas. Others have almost all winged adults like dragonflies, grasshoppers, butterflies, bees. In some groups wingless adults are more common like in cockroaches, crickets, wasps, moths, and even flies. Some insects have a modified pair of wings. Beetle forewings are modified into hard shells called elytra. Flies appear to only have one pair of wings because their hindwings are reduced to little nubs called halteres which aid in balance. The scientific name for the group flies belong to is Diptera which translates to “two wings”.



Caption: This dogbane beetle (*Chrysochus auratus*) at first glance may look wingless. The hard shell covering its abdomen are elytra, the beetle's forewings. Underneath the elytra are a pair of membranous forewings used for flight.

Let's Explore A Worm Bin!

What do we see when we open up the worm bin?



Let's take a closer look.....



It's newspaper!

Newspaper—even the ink!—is biodegradable, so it is safe for the worms to eat.

Newspaper isn't just worm food. It also helps absorb any extra liquid from decomposing food, and from the compost itself. This keeps the worm bin not too wet and not too dry: just right!

When we move the newspaper, what's underneath?



A whole bunch of dirt? Or mud? What do you think?

Let's take a closer look....



**It's compost!
Also known as worm poop.**

After worms eat organic material like plants, fruits, and vegetables, the worms poop out a nutrient-rich waste. All of the good nutrients in their poop help more plants grow and keep the soil healthy.

**What are some foods the worms are snacking on?
Let's see what we can find....**



Compost worms love to eat raw vegetable scraps like carrots, broccoli, zucchini, potatoes, cabbage, and corn.

They like some fruit, such as banana peels and apple cores. They won't like anything that's too sour, such as an orange or a lemon.

They won't like anything that's greasy or oily, or dairy such as cheese.

The worms can eat meat, but they take a long time eating it, which means the meat will go bad in your bin and make it stinky!

They'll eat beans and grains. We feed our worms a vegan diet to keep them (and the bin) happy and healthy.

Let's meet our worm friends!



Compost worms are small, wiggly, and squishy. It is good to be gentle when handling them so they don't accidentally get poked too hard.

Worms love to be underground where it's dark, in damp dirt. Worms don't like to dry out!

They don't have teeth so they can't bite you—this also means they can't chew their food! They grind their food up after they swallow it, in a special organ called a gizzard.

How long do they look? What colors do you see?
What shapes do the worms make when they wiggle?

How many worms can you find?



Caring for Our Beehives

Did you know that we have beehives on top of our roof? Our associate curator of entomology, Allen Lawrance, oversees the maintenance of the hives along with our volunteers. Every once in a while, they do a check to make sure that the hives are healthy, that they have brood and honey. Here's a look behind the scenes at one of these checks!

The first thing they do is use a smoker to smoke the entrance of the hive. That just kind of calms the bees down. It makes them a little less aggressive.

Then, they use hive tools to open the hive. They're like little wedges or chisels, and they help pry apart the pieces of the hive. You might not realize it, but the hives stick together because the bees "glue" it shut. The bees use something called propolis, which is made from collected plant resins, to create a bee glue and seal the hive up.

They use the tools to pry it apart and they take it apart piece by piece. They then pull out a couple frames to inspect them, just to make sure everything looks good. Then, when it looks like everything is good, they put the hive back together.



What do you notice about the bee hives?

What do you wonder about them?

Let's Meet Some Cockroaches!

Cockroaches are an oft-reviled and overlooked insect, but we have quite a lot to learn from them. Cockroaches make really great model organisms in classrooms for studying insects because you can really clearly see all their body parts. Just like other insects, they have six legs, three main body part (a head, thorax, and abdomen), two long antennae, and compound eyes.



Something that everybody should know about cockroaches is that only a few species are actually pests of homes. The vast majority live out in the wild in the woodlands and help decompose wood and other things. These are Madagascar hissing cockroaches, so they're not native to Illinois, but they make really great pets because they're large, slow moving, and they're not pests of homes.

Why are they called Madagascar hissing cockroaches? It's because they can make a hissing sound. They can store air inside their body and then push it out really fast through holes along the sides called spiracles. That's where they breathe through, and when they do that it makes a hissing sound. You can actually see the spiracles on a Madagascar hissing cockroach up close without a magnifying glass.



These American cockroaches actually can be pests of homes, so they're not recommended pets. We have them in our educational collection here at the Nature Museum so we can get a closer look at them as these are insects that we actually are likely to encounter in our homes.

Did you know that cockroaches are rather social insects? A lot of insects are solitary and live their entire lives completely alone, but different species of cockroaches live together in different ways and they are really interesting to study, because we can learn more about different types of social structures and different types of societies. Some of the most social insects known are termites that live in massive colonies, and it was found out recently that termites are actually just social cockroaches.



Cockroaches get a bad rap because they can smell bad, they can set off allergies if little hairs on their legs break off and they get inhaled, however they don't transmit any diseases, and the best way to keep them out of your home is just to clean up. Don't leave any crumbs. Don't leave any standing water. And make sure all the entrances around the outside of your home are sealed up nice and tight. Cockroaches can be great decomposers. They eat food that falls on the ground or decomposing wood, or basically organic plant material. They're kind of like nature's recyclers!

Let's compare Madagascar hissing cockroaches and American cockroaches!



Write down two similarities you see:

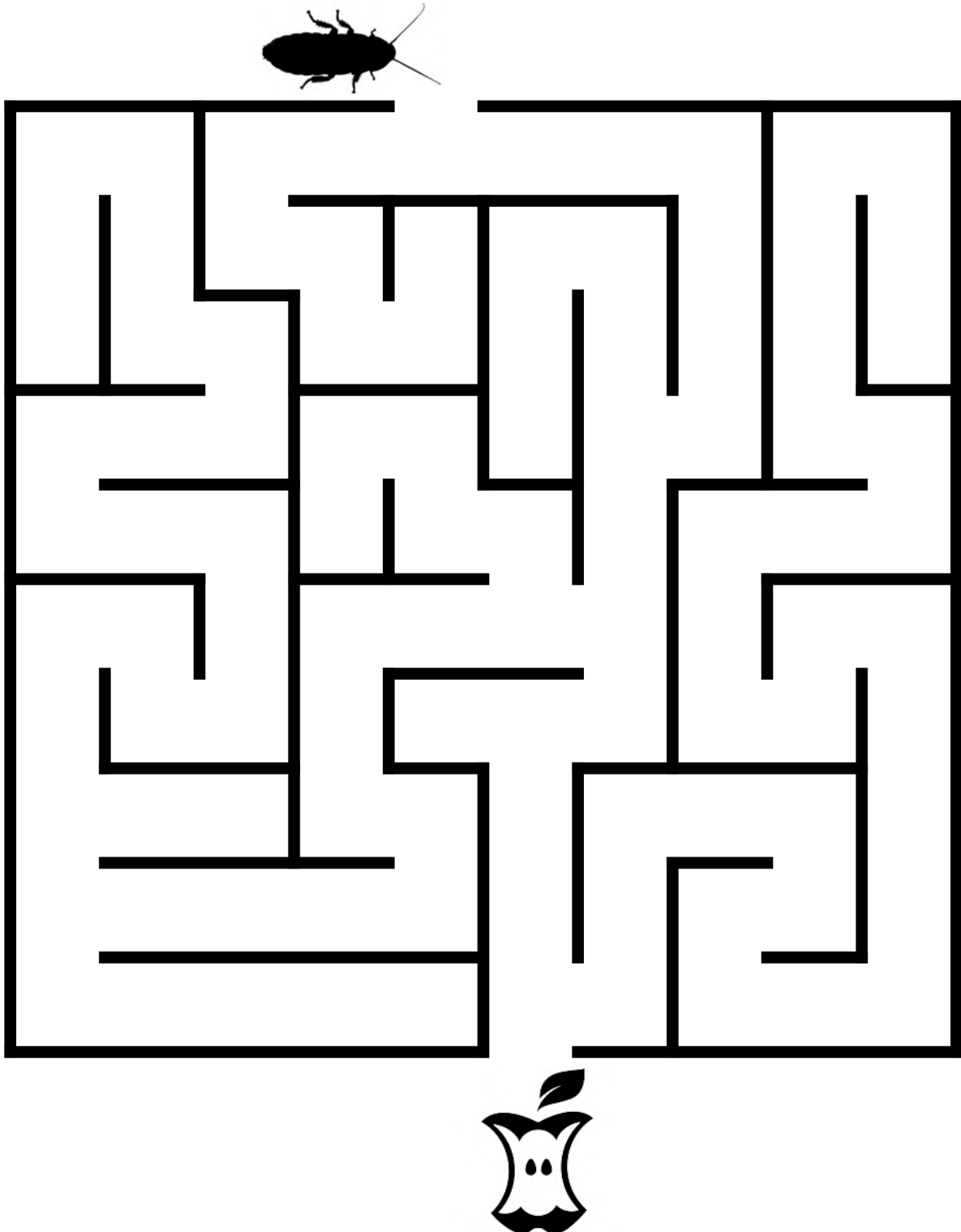
Write down two differences you see:

How can you tell that they are both insects?

What else do you wonder about cockroaches?

Make Your Way Through the Maze

Help the cockroach make its way through the maze! Use a pencil, pen, or crayon to make your way through the maze below and mark out a clear path for the cockroach to take to get to the yummy food scraps at the end!



Let's Meet Some Water Bugs

In addition to all of the amphibians and reptiles at the Nature Museum, we also care for a number of insects! Here's a look at a couple of cool aquatic species you may not have noticed before.

This is a sunburst diving beetle. They are aquatic insects that live in freshwater and they can move pretty fast. They're able to stay underwater for long periods of time because they are able to collect an air bubble and then dive deep into the water with it. You can see it at the back of this beetle's abdomen. These beetles are carnivores and we'll often feed them small crickets. They will actually hunt down their prey in order to catch them.



This is an abedus, also known as a giant water bug. Like the sunburst diving beetles, these are also water insects. They live underwater. They are also carnivores. They have sort of a needle-like mouth. They inject that mouth into what they catch, in this case a cricket, and they inject some enzymatic juices into them, dissolve the inside of the cricket, and then suck it back up like a straw. This one happens to be a male, so you can see he is carrying the eggs on his back. The males are actually the ones that carry the eggs. They live in slow-moving bodies of freshwater, like ponds and streams.



What do you notice about the sunburst diving beetle?

What do you notice about the giant water bug?

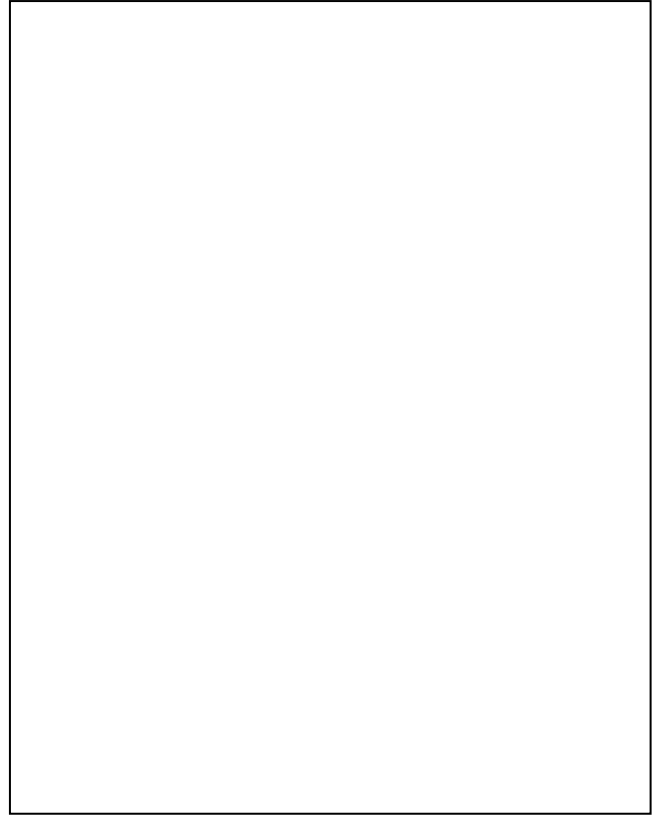
What do you wonder about them?

Neighborhood Species

Species name:

Description (color, size, etc.):

Diet:



Habitat (where did you see it?):

Behaviors (what was it doing?):

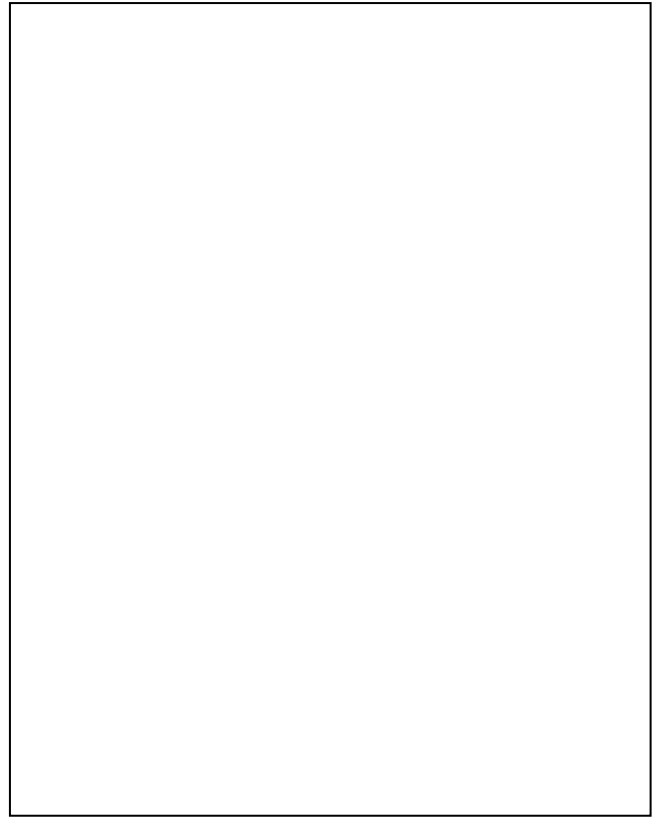
Drawing and research done by: _____

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Species name:

Description (color, size, etc.):

Diet:



Habitat (where did you see it?):

Behaviors (what was it doing?):

Drawing and research done by: _____

My Observations

I'm observing_____.

I notice:

(use words and drawings to describe what you're observing)

I wonder:

(write all the questions you have about what you're observing)

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I'm observing_____.

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Story Time Graphic Organizer

Story Time Book Title: _____

Use words and pictures to share about
a main idea in the story you read.

Describe some adventure or exploration that happened.

How is nature involved in the story?

As you were reading the story, how did you feel?

Does the story give you any ideas in your own life?

After reading the story, what do you wonder?

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