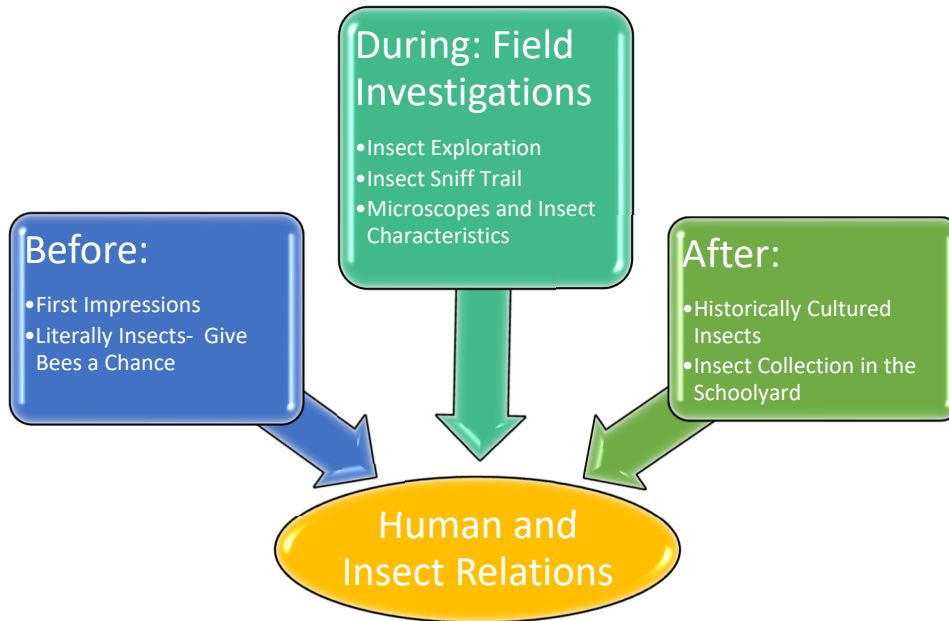


# Incredible Insects



Your students will be visiting Blandy to engage in a field investigation focused on insect structure, adaptations, and habitat.

To enhance classroom connections, we have developed this lesson cluster. **Field investigations** are more meaningful to students when integrated into their curriculum. This lesson cluster can be used to introduce and/or review and synthesize for a systems approach and increase depth of knowledge. **Before-visit activities** introduce students to the diverse world of insects and expose preconceptions. With the **after-visit activities**, students delve more deeply into human-insect relationships over time or explore the invertebrate biodiversity of their own school setting.



# Incredible Insects

## BEFORE 1: Project WILD First Impressions

**Before** your visit to get students thinking about how they feel about insects and why. Students will (1) distinguish between reactions to an animal based on myth or stereotype and those based on facts, and (2) recognize the value of animals' contributions to ecosystems, even those that people sometimes respond to with fear.

### VA Standards Addressed

English/Language Arts (2017): 2.12, 3.10

Science (2018) 2.1 c, d, f; 2.6; 3.1 c, d, f; 3.5

Mathematics (2016): 2.15; 3.15

### Materials

- Appendix A: Insect set ([Appendix A](#)) of a variety of invertebrates, including some the students might think are "cute" and some they might think are "scary". NOTE: You may choose to focus on just insects, or use insects and other invertebrates and have students classify the organisms to reinforce insect structure. A sample Appendix A: Insect set is included at the end of this document.
- Scissors
- Glue sticks
- Initial Impressions Graphing Datasheet
- Materials to make a flyer (Or use a computer)



### Background

People respond differently to different invertebrates. For instance, some people express fondness for butterflies but may feel disgust or fear when confronted with a cicada. Their first reaction may be to recoil if they see a cicada; their second may be to kill the animal as quickly as possible. Yet cicadas cannot hurt a person, and provide important food in an ecosystem.

### Lesson Preparation

1. Prepare sets of images showing a variety of different invertebrates. You'll need two sets per team of 2-3 students.
2. Divide students into groups of 2-3

### Instructional Strategy

1. Student teams cut out the images of insects and sort them based on how they feel about each invertebrate (☺, ☹, 😐). They then take these sorts and use them to create a graph of first impressions.



# Incredible Insects

- a. Alternative: Do this as a whole class - Show a large version of each image to the students, asking them to take turns saying the first word that comes to their minds as they look at the picture. Record the name of the animal and the words the students suggest on a table. Accessibility note: students can also give a thumbs-up or thumbs-down in response. Images can be sorted based on the majority response.
2. Ask the students analyze their data - identifying if they which category got the most/least responses.
3. Ask each team to find out more about one of the animals (you may let them choose, or make assignments).
  - a. First, they should list what they think and already know about the invertebrate (including their reactions)
  - b. Then, they conduct research. In their research, the teams should try to figure out whether or not the reactions of the students to the animals were based on fact or opinion.
4. Each team prepares a flyer about the invertebrate, including a labeled image of the organism, and a description of what it does in its habitat. The goal is to convince others that they have the coolest invertebrate.
5. Ask the students to present their flyers. Talk about the values and contributions animals make-from ecological to aesthetic. Ask if their feelings about the organisms changed, and why or why not.
6. Students then cut out the same images and do a new sort.
7. Return the initial sort, and ask them to look at their data:
  - a. What changes are there?
  - b. What stayed the same?
8. As a class, discuss "first impression opinions" and contrast this with basing perceptions of animals, plants, people, ideas, etc. on the best evidence available.

## Extensions

1. Invite an expert to bring in live invertebrates. Reach out to extension offices, universities, or natural history museums. Prepare students by telling them what invertebrates will be brought, and help them generate a list of questions for the expert.
2. Draw a picture of a "favorite" invertebrate and one of a "scary" invertebrate. Write a short story about each, including the value of each invertebrate.
3. Prepare a series of large photos or drawings of a variety of different kinds of aquatic invertebrates. Select a range so that there are likely to be some that provide a fearful or negative "first impression." Conduct the activity as described above.



# Incredible Insects

## BEFORE 2: Give Bees a Chance

**Before** your visit to expand student thinking about insects and insect-human interactions. *Give Bees a Chance* is a lighthearted and informative text that encourages the reader to think about misconceptions and fears about bees (specifically honeybees) without disparagement. Students examine prior thinking about bees, read non-fiction to learn about bees, and then research to learn more about bees other than introduced honeybees.

### VA Standards Addressed

English/Language Arts (2017): 2.8; 2.10; 2.12; 3.6; 3.8; 3.10

Science (2018): 2.1 a, d, f; 2.5; 3.1 c, f

### Materials

- At least one copy of *Give Bees a Chance* by Bethany Barton (one book for whole class, or a set for reading in rotation during language arts stations). <https://www.youtube.com/watch?v=XbmOR7M-ouw>
- Optional: photocopy or list of the bees on pages 3-4 and on the inside covers
- Large board or paper for a Know, Wonder, Learned (KWL) chart
- Additional research tools for learning more about bees (Identification guides, internet access) Possible useful websites for learning more about bees:
  - A list of bee species that have been identified at Blandy can be found <https://blandy.virginia.edu/newbeediversity>
  - Bumble bees of Virginia [https://www.vaworkinglandscapes.org/wp-content/uploads/documents/VWL\\_handouts/Bumble\\_Bees\\_of\\_Virginia\\_Pamphlet\\_VWL.pdf](https://www.vaworkinglandscapes.org/wp-content/uploads/documents/VWL_handouts/Bumble_Bees_of_Virginia_Pamphlet_VWL.pdf)
  - A general overview of bee genera <https://www.mnn.com/your-home/organic-farming-gardening/stories/how-identify-different-types-bees>
  - Clicking on the images on the page brings up additional information on that species. <https://www.insectidentification.org/bees-ants-wasps-and-similar.asp>

### Lesson Preparation

1. Set up a large KWL chart

Know	Wonder	Learned

2. Pre-read *Give Bees a Chance*
3. Decide which literacy and grouping strategies you plan to use

### Instructional Strategy

1. Access prior knowledge:
  - a. Ask students what they know about bees. Record student responses in the “Know” column.
  - b. Ask students what they wonder about bees. Record these responses in the “Wonder” column.
2. Read for Information:



# Incredible Insects

- a. Read *Give Bees a Chance* during language arts time. This can be a small group read, a team read, a read aloud. Depending on your language arts needs, different elements of the text can be examined.
  - b. As students make discoveries in the text, record these findings in the “Learned” column. If the Learned answers a “Wonders” or confirms/refutes their “Knows”, record it in the same row as the previous entry.
3. Research:
- a. Have individuals or pairs select one of the other bees in the book to look up (listed on the inside covers and on pages 3-4 of the text).
  - b. If there are any persistent and unanswered “Wonders”, those can be researched.
4. Synthesize:
- a. Use the research findings to prepare a 1-2 page addition to the book with similar formatting, conversational tone, and scientifically accurate images.
  - b. Have students either present their pages, or make copies and assemble into books for students.
5. Conclude: Discuss their learning and add new information/correct misconceptions on the KWL chart.



# Incredible Insects

## Field Investigation:

**During** your field investigation at Blandy, your students will engage in several indoor and outdoor lessons where they will explore insect diversity in a myriad of ways. Students discover insect survival mechanisms, such as mimicry and camouflage. They investigate life cycles and use magnification tools to examine insects up close and personal. And they develop an appreciation for the diversity of insects in our watershed habitats.

Below is an overview of the “typical” program activities to assist you with integrating this field investigation into the classroom experiences. The activities can change due to weather, volume of students, or through communication with environmental educators.

- **Insect Collection:** Students seek insect in a variety of habitats, carefully capture them, and then observe physical characteristics, adaptations, and behavior before releasing them in their homes.
- **Insect Diversity through Microscopes:** The physical characteristics and adaptations of pinned insects are observed through microscopes and other magnifiers. Students create scientific illustrations or describe their findings.
- **Lepidoptera Sniff Trail:** Information about butterfly or moth host plant, egg, larva, pupa, and adult phases is sniffed out by students in a nasal scavenger hunt.
- **Insect Modeling (Teacher Led):** Students listen carefully for details about the appearance if a “mystery insect” appearing in a story read by their teacher. They then use the details to draw the insect described in the reading.

## VA Standards Addressed

Science (2018): 2.1; 2.4; 2.5; 2.7; 3.1; 3.4, 3.8

Math (2016) : 2.15, 2.16; 3.15; 3.16



# Incredible Insects

## AFTER 1: Historically Cultured Insects

**After** your visit to explore insects in ancient history. Just like today, people of the ancient world had complex relationships with insects. Some were considered pests, some inspired mythology, and some were economically important. Students demonstrate understanding of how insect form influences behavior and the characteristics of an ancient culture by creating a “product” that would have been utilized in that culture.

### VA Standards Addressed

English/Language Arts (2017): 2.8; 3.6

Science (2018): 2.1 f; 3.1; f

History/Social Science (2015): 3.2; 3.3; 3.4

### Materials

- At least one set of 25 Appendix B: Historical Insect Cards ([Appendix B](#)) that identify ways in which insects and other invertebrates were used in the ancient cultures of Mali, Egypt, China, Greece, and Rome.

### Background

Ancient Egypt, Greece, Rome, and China have rich written histories, while the Empire of Mali utilized a more oral history tradition. The former cultures also worked extensively in stone and metal to produce art, while Ancient Mali used more textile, wood, and other biodegradable substances. As a result, I found it difficult to identify insects in the culture of Ancient Mali. The folklore and use of insects presented in this lesson are from oral histories and current cultures of the peoples who now occupy the territory of Ancient Mali, and have likely been passed down through the ages.

### Lesson Preparation

1. Select a grouping system that works for your students. Each student could get one card, then move around the room to compare with others, pairs could get packs of a few cards, or small groups could each get their own set.

### Instructional Strategy

1. Students read the cards to learn about how insects were used in ancient cultures. Compare between cultures: was the same insect viewed the same way in each culture? Do some kinds of insects come up again and again?
2. Sort the ways that insects were used. Possible categories can include: as pieces of art, in religious ceremonies, as myths to explain the world, as economic value (used to create a product or used for food). You may wish to have students explain their sorts and to propose moving insects from one category to another.
3. Students then choose an insect that they have become curious about during the course of the unit to create a product that could have been used in Ancient China, Greece, Rome, Egypt, or Mali.



# Incredible Insects

- a. The student needs to be able to justify 1. why the product would have been used by that particular culture, and 2. what attributes of the insect make it appropriate for the product.





# Incredible Insects

## AFTER 2: Insect Collection in the schoolyard

**After** your visit to complement the insect collections and investigations conducted at Blandy. Students carry out explorations to determine what insects can be found in their schoolyard. Students can learn how to use identification tools to figure out the insect diversity of their school and contribute to community science.

### **Background**

A bioblitz is when a group tries to find and identify as many organisms as possible over a short period of time. There are several opportunities for your students to contribute to be citizen scientists as they learn about the insect world. The Xerces Society has some great tips for contributing to citizen science.

<http://www.xerces.org/citizen-science/> If you, your students, or parents took any photographs of insects, consider sharing them on social media! #blandynature

### **VA Standards Addressed**

Science (2018): 2.1 b, f; 2.4; 2.7; 3.1 b, c, f; 3.4; 3.5

Mathematics (2016): 2.15; 3.15

### **Materials**

- Timer
- Devices with which to photograph (with iNaturalist Seek app installed, optional)
- Tools for finding/capturing insects: white sheets, nets, collection containers (re-use baby food jars or other small jars with holes poked in lids), etc.

### **Lesson Preparation**

1. If using, download the iNaturalist Seek app to the devices the students will be using. Practice using it a few times yourself. This app tries to identify the organisms in the camera's view. Observations can also be posted for later identification.
2. Scope out possible locations for finding insects. Take note of any potential hazards.
3. Make note of the date and weather conditions for future analysis.

### **Instructional Strategy**

1. Inform students that they will be learning outside today, and that they are expected to use their classroom rules, not recess rules. Emphasize that insects are animals, and they should take care to not harm them.
2. There are several ways to capture insects. Choose the strategy(ies) that best suits your location, timing, and materials. We recommend setting a timer to limit the collection:
  - a. Place a white sheet under a shrub in the schoolyard. Use a wooden stick or dowel to gently shake the shrub. Slower moving insects should fall to the sheet. Place insects in small jars for observing, identifying, and taking photographs.
  - b. Use nets to capture flying insects.



# Incredible Insects

- c. Look under rocks, logs, and even human-made objects, or leaf litter for insects.
  - d. Black lights can be used to find caterpillars in the dark.
  - e. Moths and other nocturnal insects are attracted to light. Hang a sheet near an exterior light overnight to see who visits.
  - f. If there are enough devices, photograph insects instead of collecting them.
3. Help students collect insects using your preferred method, and place them in containers.
  4. Once collected, have students draw/photograph the insects while they make observations. Guide them with inquiry questions such as:
    - a. What do you observe?
    - b. Why is the insect moving like that?
    - c. Can you see all the body parts (head, thorax abdomen?)
    - d. How many legs are on the insects?
    - e. Are there creatures in or on the sheet that are NOT insects?
  5. If using Seek, students can use the app to attempt to identify their organisms. If no identification is offered, upload the photo for crowdsourced identification.
  6. When all organisms have been documented, return them back to their habitat. Remind students that these living creatures have a job/function in their environment, and students need to return the insects as close to their home as possible.
  7. Inside, analyze the data.
    - a. Sort the insects into groups based on a physical feature and then graph and compare. For example, a bar graph could highlight different wing or leg types.
    - b. If doing this with multiple classes (or at different times), compare student findings between classes. Does weather seem to make a difference?

















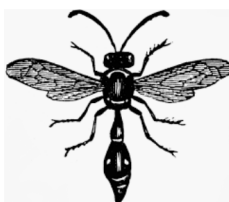

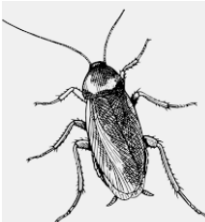



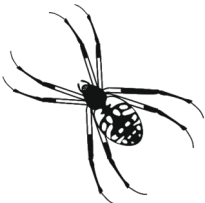
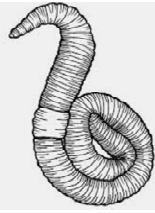

## Extensions

1. Use photographs and identification to create a field guide to the insects of your schoolyard.
2. Collaborate with the art teacher to have students re-create the organisms and their habitat, combining them to create an ecosystem.
3. Track when insects are seen (<https://xerces.org/citizen-science/>)
4. Use [https://www.inaturalist.org/pages/seek\\_app](https://www.inaturalist.org/pages/seek_app)



# Incredible Insects

## Appendix A: Insect set

 June Beetle	 Camel Cricket	 Praying Mantis	 Ant	 Tiger Moth
 House fly	 Grasshopper	 Butterfly	 Water Scorpion	 Cicada
 Lightning beetle	 Yellow Jacket	 Mosquito	 Dragonfly	 Woolly bear caterpillar
 Bumblebee	 Wasp	 Dung beetle	 Cockroach	 Mayfly
 Rolly-polly	 Centipede	 Garden Spider	 earthworm	 Snail






# Incredible Insects

## Initial Impressions Graphing Datasheet

Names \_\_\_\_\_

Sort the animal images by how you feel about them. Glue them in the column that matches.

Types of Animals



## Incredible Insects

### Appendix B: Historical Insect Cards

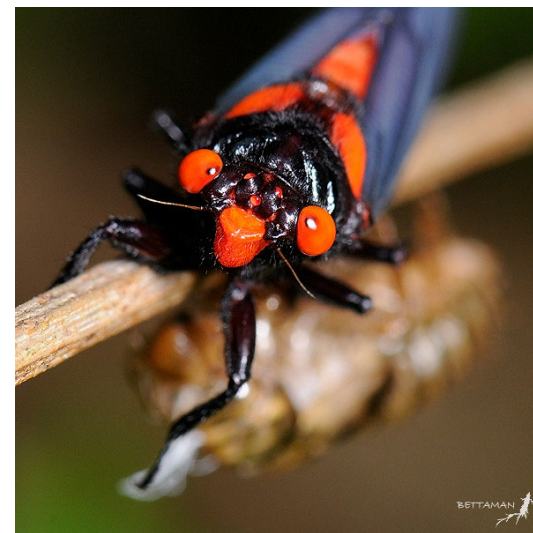
Ancient Chinese saw cicadas as a symbol of cycles. They saw them come out of the ground, shed their exoskeleton, and the fresh adult spread its new wings. Cicadas were eaten as a special treat during the nymph stage of the life cycle, and one species of cicada was used for medicine! Nymphs are still eaten and the medicine is still made today!



A jade cicada used in ancient Chinese [funerals](#)



Deep fried larvae of cicadas from modern central China. [Photo by Xiangrui Huang.](#)



The black and scarlet cicada used to make medicine. It is also used to make red and yellow dye. [Photo by Shipher](#)





## Incredible Insects



Since the time of Ancient China, silk has been made from the cocoons of *Bombyx Mori* moths, a species that **ONLY** eats mulberry leaves! The larvae (caterpillars) are usually called silkworms.

A worker unwinds the cocoons while machines spin the fibers into thread. [Photo by Airman 1<sup>st</sup> Class Amber Ashcraft](#)



A silkworm caterpillar makes silk to spin its cocoon as it enters the pupa part of its life cycle.

[Photo by Baishiya](#)



## Incredible Insects



In ancient China, a praying mantis symbolized cruelty and mystery.

Praying mantis jade carving from Ancient China. [Photo by Galerie Zacke](#)



Starting in Ancient China, people kept crickets and katydids in cages to enjoy their songs and to bring good luck.



## Incredible Insects

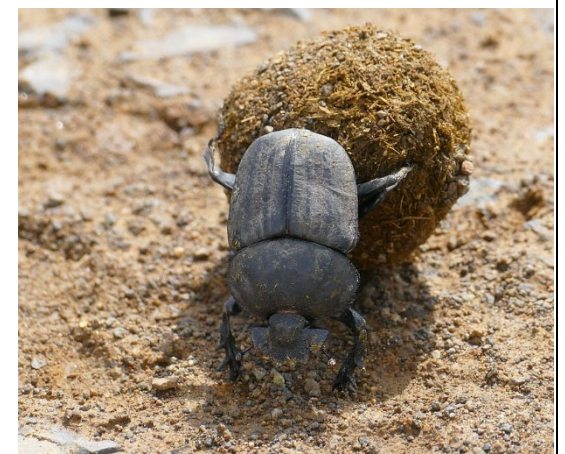


The ancient Chinese calendar was divided into 24 “months” based on patterns of the sun. The third was called “Jing-Zhe” (惊蛰) which means “the waking of the insects”. Farmers knew that when insects started to wake up from winter, it was time to plow the fields!



Ancient Egyptians watched the sun roll across the sky and watched scarab beetle roll dung across the ground. Every night the sun went down, like a beetle into the ground. Every morning the sun came up, like new beetles hatching from the ball of dung. Because of this, they used scarab beetles as the symbol for Ra, the sun god.

A collection of carved scarab jewels



[Beetle photo by Bernard Dupont](#)





## Incredible Insects

In ancient Egyptian mythology, bees formed from the tears of the sun god Ra.

[Photo by Chris Beckett](#)



The ancient Egyptian “Order of the Golden Fly” was a military honor. They watched horseflies bite fiercely, and to keep coming back, and though that such bravery was good for soldiers.

Replica golden fly medals from the belongings of Queen Ahhotep I



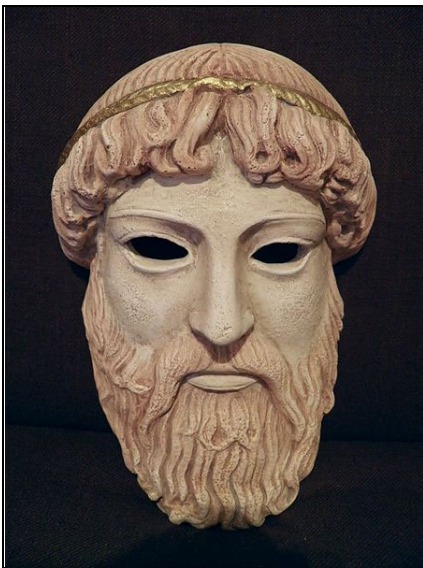
## Incredible Insects



Mantises were shown in the ancient Egyptian Book of the Dead as gods who led souls to the underworld.

Hieroglyph of a mantis [Photo by Francis Dzikowski](#).

[Mantis photo by Ivan Radic](#)



In ancient Greece, scarabs AND eagles were both symbols for Zeus, king of the gods. Greek storyteller Aesop wrote the fable of the eagle, scarab, Zeus, and the hare.



The emblem of the eagle and the beetle, from Andrea Alciato's Emblematum Liber (1534)





## Incredible Insects

The honeybee was a sacred symbol for Artemis, goddess of the hunt, animals, and the moon.

This silver coin is from Ephesos, city of Artemis.

These statues of Artemis are decorated with bees.



*Eos and Tithonus*



The ancient Greek goddess Eos, goddess of the moon, begged Zeus to make the man she loved live forever. Zeus granted her wish, but she didn't ask for Tithonus to stay young forever. Eventually he grew so old, he shrunk into the first cicada.

Poets and musicians wrote poems and songs based on the sounds of cicadas.



Ancient Greek cicada coin



## Incredible Insects



Moths and butterfly wings were the symbol for Psyche, ancient Roman goddess of the soul.

Mosaic in which Psyche steals the bow of Eros, located in the Hatay Archaeology Museum, Antakya

Classical sculpture located in the Louvre museum, Paris



Locusts are very large, very hungry grasshoppers that can destroy crops. In one Greek myth, Hercules drove away a cloud of locusts from Mount Oeta.

Locust swarm

The sounds of locusts and crickets also inspired poets and musicians. These medallions honor their sound.





## Incredible Insects

Ancient Roman nobles ate beetle larvae as a special treat.



Image of guacamole with marlin, Parmesan, pomegranate and chincuil worms from Punto MX restaurant in Madrid, Spain.



Ancient Romans and Greeks used insects that eat the sap of oak trees to make a bright red dye.



The Coronation Mantle of Roger II of Sicily, silk dyed with kermes and embroidered with gold thread and pearls. Royal Workshop, Palermo, Sicily, 1133–34. Kunsthistorisches Museum, Vienna.





## Incredible Insects



[Anansi and the jaguar by Janice Skivington](#)

Anansi is a trickster from the myths of the Ancient Mali that looks like a spider and plays jokes on other animals.



Anansi the Spider: A Tale from the Ashanti by Gerald McDermott



Wild silkworm cocoons were collected by the Ancient Mali to make silk fabric. Empty cocoons were also filled with pebbles and turned into dancing rattles.

Modern Madagascar silk, image from the UN Sericultural commission



<http://inserco.org/en/madagascar>



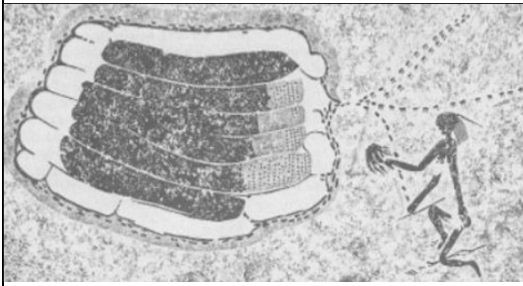
## Incredible Insects



Oko, was the ancient Mali god of agriculture. Bees were his messengers. Honey is still an important food in Africa today!

Traditional beehive in the Province of Ouham, Central African Republic ([Photo: Bruno Bokoto de Semboli](#))

Shaman with deer/bee face, 6,000-9,000 B.C.E.



This ancient rock painting from Zimbabwe depicts a person smoking out a beehive. (Image © the International Bee Research Association, [www.ibra.org.uk](http://www.ibra.org.uk))



Tassili Cave Drawing (Northern Algeria)  
Drawn by Kat Harrisson McKenna from photograph by Lajoux (1961)



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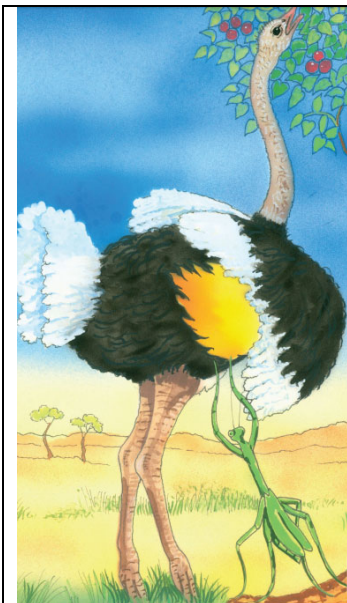
## Incredible Insects



An ancient Mali saying calls bagworms “the one who collects wood, but sleeps in the cold”, because they build cocoons out of sticks that look like firewood.

[Bagworm](#) from Johannesburg, South Africa

[Ugandan women carrying firewood](#), photo by Museruka Emmanuel



An ancient Mali myth says that praying mantis stole fire from ostrich and shared it with humans.

Fire Myths: Mantis Steals Fire from Ostrich, [Scholastic poster resource](#)

[Photo: BBC Earth](#)



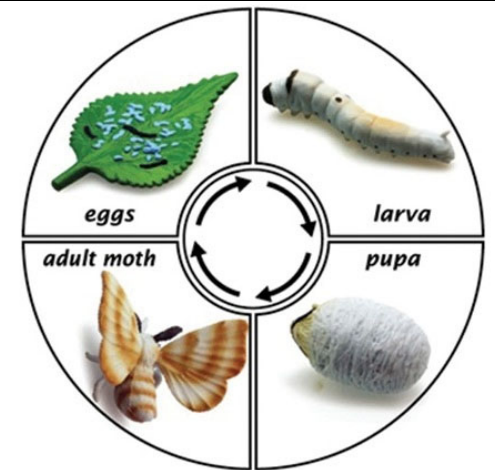


# Incredible Insects



[Zu/'hoasi women of the Western Kalahara Southern Africa in the Caterpillar Dance](#)

The Ancient Mali used cocoons as symbols for girls growing up, and women would dance together like a wiggling caterpillar. The life cycle of a butterfly was a symbol for adulthood. Both are still used today!



[Life cycle of a silkworm moth](#)



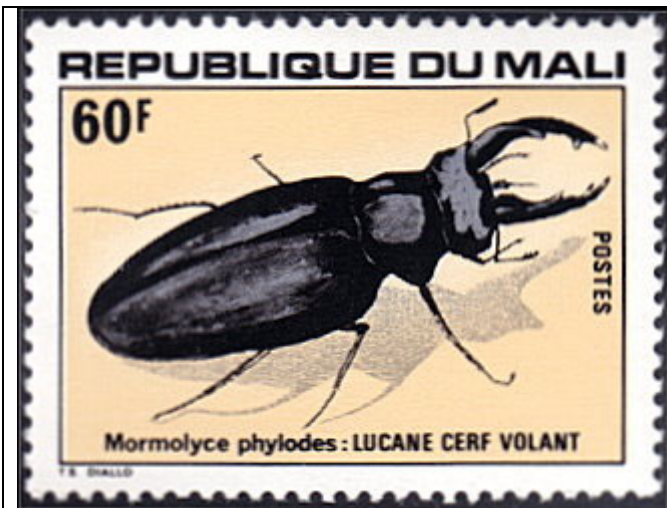
## Incredible Insects



In Ancient Mali butterfly masks (Yehoti) were used to ask the gods for growth during spring months.



[Butterfly mask](#). Nuna peoples, Burkina Faso (National Museum of African Art)    Modern agricultural techniques in Mali. [Photo by Anastasia Sogodogo/USAID](#)



“He has a beetle in his head” is an ancient Mali saying that means someone is acting strangely.

[Modern Mali postage stamp](#)



[Mali postage stamp from 1967](#)

