

Portable Collections Program

Butterflies



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What's in the Case?

Specimens



Butterflies from North America
Riker mount #1



Butterflies whose patterns mimic or resemble other things
Riker mount #2



Iridescent butterflies
Riker mount #3



Leaf camouflage butterfly
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Black and white spotted butterflies
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Bright-colored butterflies
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Butterfly with different upper- and underside patterns
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Butterflies with tails
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Butterflies that use the same color in different ways
Riker mount #11



Individual butterfly plastomount



Butterfly lifecycle plastomount

What's in the Case?

Tools & Resources

Butterfly lifecycle poster

Butterfly lifecycle model

Eyewitness video: "Butterfly"

Hand lenses

Butterflies (Peterson Field Guides for Young Naturalists) by Jonathan Latimer

Are You a Butterfly? by Judy Allen

The Very Hungry Caterpillar by Eric Carle

Butterflies of the World (Fandex Family Field Guides) by Fandex

How to Handle Scientific Specimens

Learning to handle specimens from the Museum's natural history collection with respect can be part of the educational experience of the case. Please share these guidelines with your class, and make sure your students follow them in handling specimens in the case:

- **Students may handle the boxed specimens, carefully, under your supervision.**
- **Hold the boxed specimens with two hands.**
- **Do not shake the boxes.**
- **Temperature differences, direct sunlight, and water can be very harmful to certain specimens.** Please keep them away from radiators and open windows, and keep them secure.



How to Observe Scientific Specimens

Natural history specimens have the power to fascinate people with their mere physical presence. Specimens have the power to tell us about themselves. The opportunity to hold specimens and examine them closely forms a tangible link between your students and the natural phenomenon. Looking attentively and over time can arouse wonder, which is at the core of the learning process.

As well as arousing wonder, the process of close observation empowers students to talk about something they might think they are not familiar with. It leads them to raise questions. You can assist this process by encouraging your students to examine individual specimens in detail and think about what those details might mean. Ask them questions about what they see, and what that might tell them. For example:

- What do you see in the specimens? Describe their shape, color, design, and body structure.
- What do you want to know about them? (It is important that your students use visual clues based on their observations when giving their answers.)
- What else can you see?

As the conversation begins to grow, you can ask questions about how the specimen might have behaved and why it has the form it does:

- Where do you think this specimen lives?
- What might this specimen eat? How does it get its food?
- Why does it have that color or pattern?
- What are its different parts for?

Providing books and Internet access for researching answers to these and other questions allows student to make discoveries about the natural world and its phenomena.

An Introduction to Butterflies



To the teacher

Butterflies are magical in their movements, in their appearance, and in their transformation from ground-hugging caterpillars to airborne beauties. In particular, they attract younger students and capture their imaginations. For this reason, we have grouped the butterflies in this case aesthetically rather than scientifically. This arrangement appeals to younger children, and provides educators with material for discussion and activities centered on color, shape, and pattern.

Each Riker mount (the name for the common black specimen boxes used in this case) contains a group of butterflies selected according to their colors, shapes, patterns, or special features. For example, one group of butterflies has different patterns in black and white. Another group includes butterflies that are different colors but all have vertical lines on their wings. There are iridescent butterflies and butterflies with airplane-shaped wings, camouflaged butterflies and butterflies whose wings resemble other objects or images from everyday life. The mounts are also labeled with the butterflies' scientific names and common names where available (not all butterflies have a common name).

The aesthetic aspects of butterflies can also be a good lead-in to more scientific studies with older children. Many of the activities in the guide will work well for older students, especially when paired with the Portable Collections case on Insects. Some adaptations and ideas for older children are specified in the Activity pages.

What is a butterfly?

A butterfly is a flying **insect** of the order Lepidoptera, which means it has wings covered with scales. Moths are also part of the order Lepidoptera and the two animals are closely related, but there are some differences between them. Butterflies are generally brightly colored while moths are usually drab (though there are many exceptions to this). Almost all butterflies are active during the day, while most moths are active at night. Their antennae are also different; butterflies have long antennae shaped somewhat like a golf club, while most moths have either simple tapered antennae or complex antennae with many cross-filaments (sort of like a radar antenna).

There are about 20,000 species of butterfly worldwide, and most are only adapted to live in a small area (or range). Butterflies are adapted to all types of habitats, from rain forests to wetlands, fields, and inland forests. They can be found at high altitudes and at sea level. Each specimen you'll see in this case has a range and habitat that is unique to its species.

Colors and patterns

We may marvel at the beauty and the sheer variety of colors and patterns seen on butterfly wings, but it is important to keep in mind that these colors and patterns are not always just for show. A butterfly's very survival may depend on its physical appearance. For example, some butterflies have adapted so that they are in **camouflaged** their environment, and by holding themselves perfectly still they can escape the notice of their predators. Other butterflies do their best to stand out! They have bright coloration that acts as a warning to potential predators that the butterfly is poisonous (even though some butterflies have warning coloration but are actually quite harmless to eat). A few varieties protect themselves by imitating other more dangerous animals so that predators will think twice about attacking them. For example, some butterflies have spots on their wings that look like the eyes of much larger animal, like an owl.



An Introduction to Butterflies (continued)

Butterfly body structure

Adult butterflies have three separate body sections: the head, thorax, and abdomen. The **head** is the location of most of its sensory organs, including its antennae, its compound eyes, and its mouthparts. The middle section, the **thorax**, is the segment to which the butterfly's legs and wings are attached. The **abdomen** is the location of the butterfly's reproductive organs.

Besides their three-part body structure, butterflies also have three sets of appendages: antennae, legs, and wings. **Antennae** are an insect's sensory appendages, or "feelers." They are located on the butterfly's head, near its eyes.

All adult butterflies have six fully developed legs and four wings. Flight is the adult butterfly's main form of locomotion. Many butterflies fly extremely fast and they also have an erratic flight pattern. Both characteristics help butterflies to escape predators. (Butterflies have many predators, such as rats, birds, lizards, snakes, frogs, spiders and praying mantises.)

Butterflies have unusual mouthparts. They feed through a long tube called a **proboscis**, which coils up when not in use. The butterfly uses its eyes and antennae to locate flowers, and "tastes" the flower surface with its feet before uncoiling the proboscis and drinking the flower's nectar. Butterflies need a concentrated source of food to meet their high energy needs.

Adult butterflies' internal structures are quite different from those of humans and other vertebrates. They have a three-part digestive system made up of a fore gut, mid gut, and hind gut, which produce digestive fluids, process food, and expel waste. Their blood (called **hemolymph**) flows freely through their bodies, not enclosed in vessels. They breathe by taking oxygen into their bodies through small holes called **spiracles**. Once oxygen is inside the body, tiny tubes called **tracheae** distribute oxygen directly to the butterfly's tissues.

Butterfly lifecycle

The life of a butterfly is characterized by change, or **metamorphosis**. Like many (but not all) other insects, butterflies undergo *complete metamorphosis*, meaning they develop through several distinct stages, from egg to larva to pupa to adult. Let's take a closer look at this process:

In complete metamorphosis, insects begin life as fertilized **eggs** deposited by the female. Once it hatches from the egg, the immature insect is known as a **larva** (the plural form is larvae). Butterfly larvae are also known as **caterpillars**. They spend most of their time eating as much as they can to promote their growth, and may molt several times before they reach the next stage of their development: the **pupa** stage.

As a pupa, the butterfly enters a cocoon called a **chrysalis** and rests while its body undergoes all the internal and external physical changes required for it to reach full maturity. For example, the time they spend in the cocoon allows their legs, wings, and sexual organs to develop fully. Once the butterfly emerges from the cocoon, it enters the final stage of its development: adulthood.



An Introduction to Butterflies (continued)

Thanks to their new legs and wings, adult butterflies are more mobile than larvae. While they do use their new mobility to search for food, adult butterflies don't need to eat as much as larvae do. Instead, their main goal is to reproduce before they die. It is important to pass on their genes as quickly as possible because once they reach adulthood, most butterflies do not live very long. Most butterfly species have an adult life span of two weeks or less, and no adult butterfly lives more than a year.

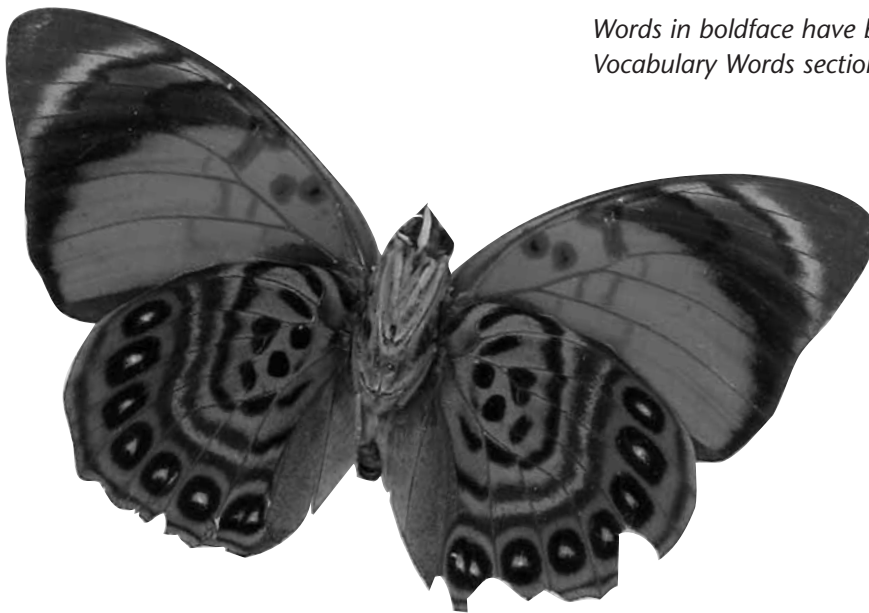
Adult butterflies are seen during the warmer months of the year. Many butterflies lay their eggs in the fall; the eggs overwinter and hatch in the spring. Each species of butterfly is dependent on one or more species of plants on which the females lay their eggs and which the caterpillars will begin to eat when they hatch. Each species of butterfly in its adult stage also has strong preferences for the nectar a particular flower.

Collecting and mounting butterflies

With their beautiful colors and intricately designed bodies, butterflies inspire people to collect them and study them. Many people enjoy collecting butterflies as a hobby, but for **lepidopterists** (scientists who study butterflies) and **entomologists** (scientists who study all insects) it can be a full-time job.

Collecting butterflies and other insects requires some basic equipment: a net to catch the insect, a container to hold it, and a magnifying lens to examine it closely. Lepidopterists and amateur butterfly hunters often study live butterflies to learn about how they behave. However, sometimes they must kill butterflies in order to preserve scientific specimens for their permanent collections. Usually this is done by placing the butterfly in a jar with a small amount of a poisonous chemical, such as cyanide or ethyl acetate. Lepidopterists preserve their butterfly specimens in a number of ways, but most often by spreading their wings and legs and pinning them to a small board. Sometimes butterflies are preserved in plastic mounts, like two of the specimens in the case. Caterpillars and adult butterflies of some species can also be preserved in chemical fluids. □

Words in boldface have been included in the Vocabulary Words section on page 24.



Information About the Specimens in the Case

The butterflies in the case are grouped aesthetically rather than scientifically in order to facilitate activities with younger children. Most of the specimens are mounted in standard boxes called Riker mounts. Two other specimens are encased in a plastic block known as a plastomount.

Visit www.brooklynkids.org/emuseum for more information about individual butterflies, and to see other specimens from the Museum's collection.

Butterflies from North America



The **Old World Swallowtail** (*Papilio machaon*) can be found high up on the slopes of mountains, where it likes to bask in the sun and look for a mate. This butterfly is found all around the northern hemisphere of the globe. In the late

summer and fall when the weather begins to turn chilly, **Monarch Butterflies** (*Danaus plexippus*) gather in swarms and migrate hundreds of miles south to spend the winter in colonies in California and Mexico. Female Monarch Butterflies lay eggs on milkweed plants along the way.

Butterflies whose patterns mimic or resemble other things



What images do you see in these patterns? Look for a number, a pair of eyes, the silhouette of a dog. Why is one mathematically inclined butterfly called the **88 Butterfly** (*Diaethria clymena*)? The **Buckeye Butterfly's** (*Junonia coenia*) wings are patterned with four pairs of eyespots that look like animal eyes. The eyespots frighten away predators that might want to eat it! The

Dogface Butterfly (*Zerene cesonia*) looks like it has an ordinary yellow and brown pattern—until you see the profile of a dog's head on each forewing.

Iridescent butterflies



Some butterflies show iridescence on their uppersides of their wings. Iridescence is the play of color and flashing of light that show on an object as an observer changes his or her viewing position to that object. Morpho butterflies

live in the rainforest canopies of Central and South America. Light reflects at different intensities on the wings of the **Blue Morpho** (*Morpho menelaus*). The bright shine and dazzling blue color of *Morpho cypris* make its wings look almost metallic. The smallest butterfly of the group, the **Spotted Adonis Blue** (*Polyommatus punctifera*), is found in northern Africa in grassy meadow habitats. The largest butterfly in the group, *Morpho godarti*, shows bright iridescence in pink, violet and blue colors. The wings of *Morpho catenarius* shine softly, and they are so transparent that the butterfly's protective eyespots show through on the other side. *Prepona laertes* shows iridescence on the two blue-green bands of color that run down its dark brown wings.

Leaf camouflage butterfly

When the **Indian Leaf Butterfly** (*Kallima inachus*)



rests on the stem of a tree or plant, it draws its wings up together. The dull brown color and light markings on its underside make it look exactly like a dead leaf! Pulled together, its pointed wings create the shape of a leaf attached to the

stem or branch. Even the veins on the leaf-side of this butterfly look more like leaf veins than butterfly wing veins. Because the Indian Leaf Butterfly has such excellent camouflage, it can stay completely hidden from its predators, such as birds and reptiles.

Information About the Specimens in the Case (continued)

Black and white spotted butterflies



There is more than one kind of black and white butterfly. The **Red Helen's** (*Papilio helenus*) pattern is simple—two creamy white spots on a solid black background. Faint red markings on the lower wings explain this butterfly's name. The Red Helen uses its white spots to flash at predators. The bright color startles the predator long enough for the butterfly to get away. The **African Blue Tiger Butterfly** (*Tirumala petiverana*) shows grayish blue-white spots on a dark brown background, and *Papilio priamus* shows dark brown spots on a white background. These three butterflies show a black and white pattern completely differently.

Bright-colored butterflies



All four of these butterflies use bright colors to communicate to predators that they are poisonous—or that they are *supposed* to be poisonous! Not only does the **Orange Tip** (*Anthocharis cardamines*) have bright yellow warning colors on its wings, it shows a mottled green camouflage pattern that helps it blend with leaves and plants. The **Postman's** (*Heliconius melpomene aglaope*) background color is dark brown, and its warning colors are displayed in a dramatic pattern. The **Painted Jezebel's** (*Delias hyparete*) warning colors stand out against a white background, so it is sure to catch a predator's attention. The **Apricot Sulphur** (*Phoebis argante*) is different—it actually tastes good to predators, but its bright yellow color warns predators that it is poisonous anyway!

Butterfly with different upper- and underside patterns



Uppersides and undersides can look so different in some butterflies that it is hard to believe that the two sides belong to the same butterfly! The **Claudina Agrias** (*Agrias claudina lugens*) is found in the rainforests of South America. Its upperside shows a dark brown background with bright pink and dark purple spots. Its underside shows pink spots and an intricate pattern of brown lines and purple dots. But the two sides are not so different after all: both show the same colors, pink and purple, in different patterns. Notice that although the upperside and underside of a butterfly's wings look different, they are always symmetrical—an imaginary line runs through the butterfly and divides it into two parts that look exactly the same.

Butterflies with vertical lines



Whoever designed these three butterflies used a ruler. Thin lines run down the wings of **Cyrestis lutea** and form evenly spaced columns. Together with the butterfly's naturally horizontal wing veins, the lines form a grid of squares! The **Many-banded Daggerwing** (*Marpesia chiron*) shows perfectly straight bands that start close to the butterfly's body and emanate out toward the wing edges. The left and right edges of its wings form nearly straight lines, too. The **Fivebar Swordtail** (*Graphium antiphates*) is patterned with short, thick bands of brown and straight vertical lines.

Information About the Specimens in the Case (continued)

Butterflies with airplane-like wings



These two butterflies are a male and female of the same species, called **Raja Brooke's Birdwings** (*Trogonoptera brookiana*) because their wings are shaped like bird or airplane wings. The name "raja" comes from an ancient Sanskrit word that means "king." The male specimen (top) is solid black and shows a pattern of iridescent green tooth-shaped markings. The female specimen is larger—its wingspan measures nearly seven inches! Its background color is brown instead of black and it shows a pattern of white as well as green tooth-shaped markings. The female's wings also show dashes of bright blue iridescent color. Raja Brooke's Birdwing butterflies are found in the rainforests of Malaysia, Borneo, and Sumatra.

Butterflies with tails



These butterflies have extensions called "tails" on their hind-wings. They use their tails as a defense against their predators, such as birds and lizards. When a predator strikes, the jagged edges of its wings prevent the butterfly's vital parts (such as its head and its abdomen) from being bitten as the butterfly makes a high-speed getaway. Tails also help butterflies balance themselves and build speed while they are flying. Small spikes poke out from the scalloped bottom wings of **Baeotus deucalion**. The **Green-patch Swallowtail** (*Papilio phorcas*) shows long club-shaped tails. The **Zebra Swallowtail's** (*Eurides marcellus*) bottom wings have extremely long tails that look like daggers.

Butterflies that use the same color in different ways



Although these butterflies comprise three different species, when we look at them together they show similarities of color and pattern. Found in Africa, the **Palla Butterfly** (*Palla ussheri*) drinks nectar from the flowers of vanilla plants while its bright white and orange spots warn predators not to eat it. The **Red-spotted Purple** (*Basilarchia arthemis astyanax*) is found in the eastern half of North America and likes to drink tree sap and the juice of rotten fruit. Notice that the orange spots on its upper wings change to blue spots on its bottom wings. **Charaxes ameliae** is also found in Africa and shows a metallic blue spot pattern on solid black background.

Individual butterfly plastomount



This butterfly is a representative member of the order Lepidoptera, which includes the more than 20,000 species of butterflies. On this specimen, butterflies' basic physical structure—including four wings, six legs, and a three-part body—is clearly visible from all angles.

Butterfly lifecycle plastomount



This block demonstrates the four stages of the butterfly lifecycle. **Eggs** hatch into **larvae** known as caterpillars, which feed on plants. In the **pupa** stage, the caterpillar enters a **chrysalis** while undergoing drastic physical changes. It emerges from the chrysalis as a fully-grown adult.

ACTIVITY 1

Introductory Activity: Observation Circle

All Grades

Related Specimen: Individual butterfly plastomount

The object of this activity is to introduce the topic of butterflies by having the students look at a single specimen together and develop a shared set of observations and questions about butterflies.

Materials:

- Individual butterfly plastomount (from the case)
- Hand lens (from the case)
- Chart paper and marker

What To Do:

- 1 Seat your students in a circle, with the chart paper nearby, and tell them that they are going to be studying butterflies. Ask students what they know about butterflies and write their responses, right or wrong, on the chart paper. There is no need to correct information at this point, because the children will correct themselves as they learn more through direct contact with the specimens, through the video and other case resources, and the rest of the unit.
- 2 Pick up the individual butterfly plastomount, and explain the activity and the “rules” for handling museum specimens. Then have them pass the specimen around. Each child will look at the specimen in turn and say one thing that he or she notices about it. The others will listen and wait their turn. Again, there is no need to correct wrong information.

- 3 After everyone has had one turn, use the chart paper to record your students’ comments and group them together by theme. For example, if several students have commented on color, list the things that they have said about it, and then go on to list things that others have said about the shape or the body or the edges. Comments that don’t fit in a particular group can be added at the end.
- 4 Pass the specimen around the circle again, along with a hand lens. Repeat the exercise, encouraging children to describe anything they can see through the lens that adds to or refines what has already been said. They can also repeat what has already been said if they want, as that adds emphasis. After this second round, make another summary.

Discussion Questions:

- What do you see?
- How many sections does the butterfly’s body have?
- What do the butterfly’s eyes look like? What about its mouth?
- When you look through the hand lens, what do you see on the surface of the wings? What does it remind you of?

See page 25 for details on how this activity meets New York State Learning Standards.



LITERACY EXTENSION

Have students spend time drawing or writing about what they have seen. For grades Pre K–2, read the book *What is a Butterfly?*, which is included in the case.

ACTIVITY 2 Butterfly Detectives

All Grades

Related Specimens: All

This activity encourages students to examine the butterfly specimens from the case they hunt for answers to clues identifying different butterflies. Most clues have several possible answers. This activity works well as a whole-class activity for younger students, and may also be adapted into an individual or small-group activity for older students.

Materials:

- “Butterfly Detectives Clue Sheet” worksheet (see following pages)
- Hand lenses from the case
- Crayons, colored pencils, or markers

What To Do:

There are several ways to organize this activity, depending on whether your students are reading and on how you think it would work best with your class.

FOR YOUNGER CHILDREN Grades Pre K–2

- 1 Lay all the specimen boxes out on a table, along with the hand lenses.
- 2 Divide the class into teams of two or three children.
- 3 Read a clue aloud and have the first team go to the table and identify a butterfly that meets the specified criteria. When they have identified one possible answer, tell them what the Clue Sheet says about it. You can supplement the Clue Sheet with facts from the Information About the Specimens pages.
- 4 Each student should choose one butterfly from the choices that the class comes up with for each clue, and draw it in the space provided on the “Butterfly Detectives Clue Sheet” worksheet.
- 5 Repeat for as many clues as there are teams. Note that the clues get progressively harder.

FOR OLDER CHILDREN Grades 3–5

- 1 Create five stations in the classroom and distribute the butterfly boxes among the stations. Place a hand lens at each station.
- 2 If you like, use one of the boxes to introduce the activity and explain that the students are to read the clue and draw or write the name of the butterfly that fits the clue in the blank box. Be sure to tell them that there is more than one butterfly for many of the clues and some butterflies fit more than one clue.
- 3 Remind the students to handle the objects carefully.
- 4 Divide the students into groups and start each group at a station. After they have filled in what they can on the worksheet, have the groups rotate to another station. Repeat until all the groups have seen all the boxes.
- 5 Bring the students together at the end and go through the clues, asking for their answers and discussing the information they gathered.

Discussion Questions:

- What color/s do you see?
- What patterns do you see?
- What different shapes of wings do you see?
- Why might it be a good thing for a butterfly to hide and blend in? Why might it also be good not to blend in?
- What did you notice about any of the butterflies that wasn’t pointed out on the worksheet?

See page 25 for details on how this activity meets New York State Learning Standards.



LITERACY EXTENSION

Have students choose one butterfly specimen and write or draw about it. Remind them to describe how the specimen looks.

Butterfly Detectives Clue Sheet

Look carefully at each butterfly. What kinds of things can we learn about butterflies just by examining them closely? Use this chart to record everything you discover. Color in your pictures with colored pencils or crayons. There may be more than one right answer to each question.

	Clue: Find a butterfly that...	Choose a butterfly and draw it in this column.
1	<p>... is as dark as night. Some butterflies are mostly or all black so that they blend into shady areas. Can you find a butterfly that shows a lot of black?</p>	
2	<p>... shows orange color. Lots of butterflies show the color orange. Choose one and draw it!</p>	
3	<p>... is very big. Which are the biggest butterflies of the whole group?</p>	
4	<p>... is very small. The smallest butterfly species in the world is the Western Pygmy Blue. It has a wingspan of only half an inch!</p>	

Butterfly Detectives Clue Sheet

Look carefully at each butterfly. What kinds of things can we learn about butterflies just by examining them closely? Use this chart to record everything you discover. Color in your pictures with colored pencils or crayons. There may be more than one right answer to each question.

	Clue: Find a butterfly that...	Choose a butterfly and draw it in this column.
5	<p>... has spots that look like eyes. Eyespots on butterflies' wings look like real animal eyes and frighten predators away.</p>	
6	<p>... has wings like an airplane. These butterflies have the widest wingspan of all the butterflies in the group. They look like real airplane wings!</p>	
7	<p>... is showing its two antennae. All butterflies have antennae that are used to find nectar and to balance the butterfly while it is flying.</p>	
8	<p>... has a trunk like an elephant. Butterflies drink their food by sipping through a long, tube-like proboscis. The proboscis uncoils to drink and coils up again when it's not being used.</p>	

Butterfly Detectives Clue Sheet

Look carefully at each butterfly. What kinds of things can we learn about butterflies just by examining them closely? Use this chart to record everything you discover. Color in your pictures with colored pencils or crayons. There may be more than one right answer to each question.

	Clue: Find a butterfly that...	Choose a butterfly and draw it in this column.
9	<p>... is iridescent. Iridescent butterflies use their shiny wings to scare off predators and other males. But their beauty attracts females!</p>	
10	<p>... has scalloped wings. The edges of some butterflies' wings have tiny curves that look like the edge of a clamshell. Which butterflies' wings are scalloped?</p>	
11	<p>... has straight-edged wings. Look for butterflies whose wing edges are completely straight – no scallops, tails or spikes!</p>	
12	<p>... has wing veins outlined in black or brown. A network of tiny tube-shaped veins supports the membranes of a butterfly's wings. Just like they do in humans, a butterfly's veins carry oxygen to its tissues.</p>	

ACTIVITY 2
Butterfly Detectives (Teacher Answer Key)

Below is an answer key to the Butterfly Detectives Cluesheet. Encourage your students to talk about why the butterflies they pick out fit or don't fit into each of the clue groups.

	Question	Specimen name/Riker mount number	
1	...is as dark as night.	Red Helen, #5 <i>Charaxes ameliae</i> , #11 Blue Morpho, #3	Raja Brooke's Birdwing (Male), #9 Green-patch Swallowtail, #10
2	...shows orange color.	All specimens in Riker mount #6 Monarch Butterfly, #1 Buckeye Butterfly, #2 88 Butterfly, #2	Indian Leaf Butterfly (Upperside), #4 Palla Butterfly, #11 <i>Cyrestis lutea</i> , #8
3	...is really big.	Raja Brooke's Birdwing (Female), #9 Raja Brooke's Birdwing (Male), #9	<i>Morpho godarti</i> , #3 <i>Papilio priamus</i> , #5
4	...is very small.	Spotted Adonis Blue, #3	
5	...has spots that look like eyes.	Buckeye Butterfly, #2 <i>Morpho godarti</i> , #3 <i>Morpho catenarius</i> , #3 <i>Baeotus deucalion</i> , #101	Indian Leaf Butterfly (Underside), #4 Indian Leaf Butterfly (Upperside), #4 Palla Butterfly, #11
6	...has wings like an airplane.	Raja Brooke's Birdwing (Male), #9	Raja Brooke's Birdwing (Female), #9
7	...has a trunk like an elephant.	Claudina Agrias (Underside), #7 <i>Baeotus deucalion</i> , #1	Zebra Swallowtail, #10
8	...is showing its two antennae.	Old World Swallowtail, #1 Apricot Sulphur, #6 The Postman, #6 Claudina Agrias (Upperside), #7 Indian Leaf Butterfly (Upperside), #7 Palla Butterfly, #11 Blue Morpho, #3	Green-patch Swallowtail, #10 Dogface Butterfly, #2 88 Butterfly, #2 Painted Jezebel, #6 <i>Morpho godarti</i> , #3 <i>Morpho cypris</i> , #3 <i>Morpho laertes</i> , #3
9	...is iridescent.	All specimens in Riker mount #3	Raja Brooke's Birdwing (Male), #9
10	...has scalloped wings.	Blue Morpho, #3 Old World Swallowtail (bottom wings), #1 Fivebar Swordtail (bottom wings), #8 Raja Brooke's Birdwing (Male), #9 Raja Brooke's Birdwing (Female), #9 Red Helen (bottom wings), #5	Red-spotted Purple, #11 <i>Morpho godarti</i> , #3 <i>Cyrestis lutea</i> , #8 Green-patch Swallowtail, #10 Zebra Swallowtail, #10 Claudina Agrias (Upperside), #7
11	...has straight-edged wings.	All specimens in Riker mount #6 <i>Papilio priamus</i> , #5	88 Butterfly, #2
12	...has wing veins outlined in black or brown.	Monarch Butterfly, #1 Painted Jezebel, #6 <i>Papilio priamus</i> , #5	Old World Swallowtail, #1 The Postman, #6

ACTIVITY 3

Make a Butterfly Life cycle Mobile

Grades Pre K–2

Related Objects and Specimens: Butterfly lifecycle plastomount, lifecycle poster and model, The Very Hungry Caterpillar by Eric Carle

Butterflies go through four stages of life, from **egg** to **larva** (caterpillar) to **pupa** (chrysalis) to **adult** (the butterfly). Children will create a mobile that shows these four stages.

Materials:

- Sturdy paper plates, one per child
- Construction paper
- Pencils
- Scissors
- Markers, crayons, or colored pencils
- Yarn or string
- Glue stick
- Stapler or tape

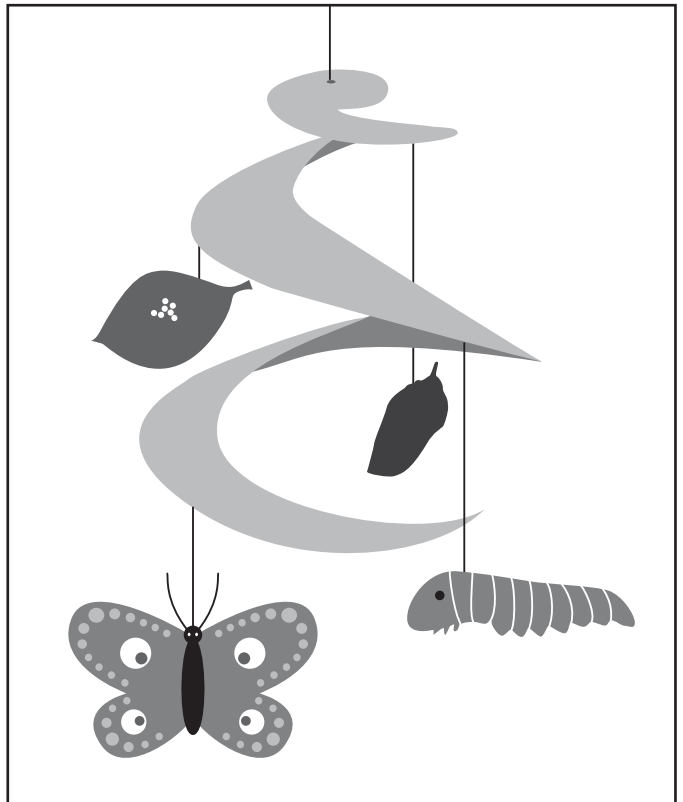
What To Do:

- 1 Introduce the activity by reading The Very Hungry Caterpillar by Eric Carle. During and after the story, talk with students about where the butterfly comes from and how it grows.
- 2 Have students examine the butterfly lifecycle plastomount, which contains actual butterfly specimens from different growth stages. Use the lifecycle poster and the three-dimensional model to introduce the idea of **metamorphosis** and the names of the stages in the butterfly's lifecycle.
- 3 Give each child a paper plate and have him or her draw a spiral on it in pencil from the center to the edge (for younger children, you may have to do this yourself). Let the children decorate their plates with markers, crayons, or paint before cutting along the spiral line.
- 4 Remind the children of what the different stages look like. Have them draw and cut out a caterpillar, pupa, and butterfly. For the egg stage, have them draw a leaf and cut it out using green construction paper, and then draw tiny butterfly eggs on it. (Butterfly eggs are usually laid on the underside of a leaf; the eggs are white or yellow or greenish, and are circular to oval.)
- 5 Help the children staple, tape, or tie the four stages to four lengths of string or yarn. Attach the other

end of the yarn to the paper plate spiral. Create a hanger for the mobiles by attaching another short length of string to the middle of the spiral, where it will more or less balance.

- 6 Hang the mobiles up and enjoy their movement!

Discussion Questions:

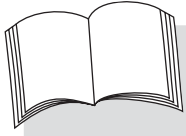


- What comes out of the egg? Is it the butterfly, or something else?
- The caterpillar is a stage in the butterfly's life that is called the larval stage. What happens to the caterpillar?
- Why is the butterfly's life called a life "cycle"?
- How is a butterfly's birth and growth different from yours?

See page 25 for details on how this activity meets New York State Learning Standards.

ACTIVITY 3

Make a Butterfly Life Cycle Mobile (continued)



SCIENCE AND MOVEMENT EXTENSIONS

- Have children act out the stages of the butterfly life cycle. The experience will be enhanced if you can play some music. For the egg phase, children can curl in fetal position on the floor. To be caterpillars, children can inch like worms across the floor. For the chrysalis stage, children stand up and cover their faces with hands and spin in a circle. For the butterfly phase, children extend their arms like wings. You can suggest or solicit from them different butterfly flying movements for them to try, such as fluttering, flitting, swooping, flying in place, hovering, fast, slow, and around a partner. This makes for a good vocabulary stretch, too!
- Children can wrap each other in paper towels so they can feel what it might be like to be a caterpillar in a chrysalis. Have them close their eyes and imagine that they are about to become butterflies. Have them stretch their “wings” and tear through the paper cocoons.

ACTIVITY 4**Butterfly Body Structure****Grades 2–5****Related Specimens: All**

All adult butterflies share the same body structure. They have four wings, six legs, and a three-part body (consisting of the **head**, **thorax**, and **abdomen**). On their head butterflies have two **antennae** or “feelers,” which help them sense the world around them. They also have two **compound eyes** made up of many hexagonal lenses or corneas which focus light from each part of the insect’s field of view. Butterflies also have a **proboscis** (a long, tube-like, flexible tongue) through which they sip nectar. The proboscis uncoils to drink and coils up again when not in use.

Children will observe the butterfly specimens in the case using hand lenses, create a list of butterfly body parts, and complete a worksheet labeling those parts on a drawing of a butterfly.

Materials:

- Hand lenses from the case
- Blackboard OR chart paper
- Library and Internet access
- “Butterfly Body Parts” worksheet (see following page), one copy per student
- Pencils
- *Optional:* Crayons

What To Do:

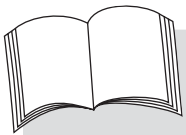
- 1 Remind your students about the guidelines for handling museum specimens (see page 3).
- 2 Break the class up into groups of 4–5 students, and give each group one hand lens and one or two specimen boxes.

- 3 Have students examine the butterflies using the hand lens. Each small group should compile a list of body parts that all their specimens have in common. Your students may not know the right word for each body part at this point, but that is not important.
- 4 Reconvene as a class and have each group share its findings. Use the blackboard or chart paper to make a master list of butterfly body parts, recording them with whatever vocabulary the students have come up with by themselves.
- 5 Once students are done comparing their answers, engage in a vocabulary-building exercise by sharing with them the correct, scientific terms for the butterfly’s body parts. Write these terms on the board as well.
- 6 Hand out copies of the “Butterfly Body Parts” worksheet (see following page). Using the master list of body parts your class has compiled on the blackboard, have each student fill in the blanks to label each body part.
- 7 (Optional) Students may color in their worksheet if they like.

Discussion Questions:

- Why does a butterfly need compound eyes like this? Do you think insects can see well with their compound eyes?
- How would you like to be able to drink all your food through a tube?
- If you were as small as an insect, would you have enough room for your five senses?
- Would you prefer to be a butterfly or a caterpillar?

See page 25 for details on how this activity meets New York State Learning Standards.



**SCIENCE
EXTENSION:
SNACK TIME
ALL GRADES**

Students can experience how the proboscis works by drinking a sweet “nectar” snack through drinking straws.

Nectar Recipe:

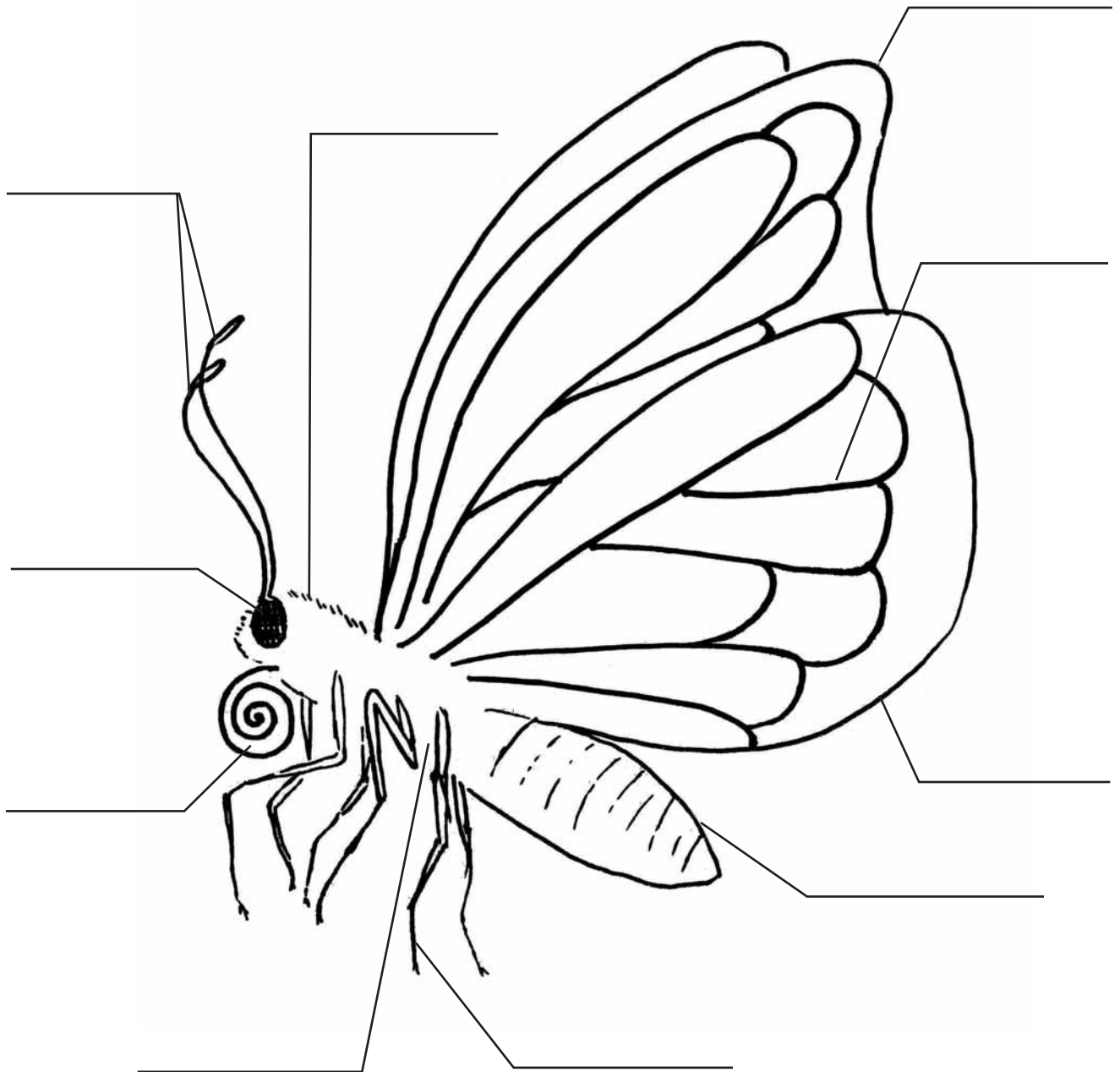
- 1 can frozen orange juice
- 4 cups water
- 2 cups lemon/lime soda
- 1 pint lemon sherbet (or ice)

Mix first three ingredients well. Add one small scoop of lemon sherbet to each cup. Pour nectar into each cup. Serve, and sip through your straws like butterflies!

Worksheet Answer Key: Clockwise from top right: forewing, wing vein, hind wing, abdomen, legs, thorax, proboscis, compound eye, antennae, head.

Butterfly Body Parts

Do you know what the different parts of the butterfly's body are?
Fill in the blanks on the lines below to label each part.



ACTIVITY 5

Create a Camouflaged Butterfly

Grades Pre K–4

Related Specimens: Leaf camouflage butterfly

Camouflage is protective coloring that helps an animal survive by blending in with its environment. It hides the animal from predators and lets it sneak up on its own prey. Students will create their own camouflaged butterflies and draw environments in which their butterflies can hide.

Materials:

- Leaf camouflage butterfly (from the case)
- “Butterfly Camouflage” worksheet, one per student (see following page)
- Construction paper
- Scissors
- Glue
- Colored markers and/or crayons
- Wooden craft sticks

What To Do:

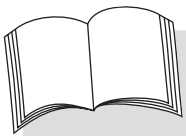
- 1** Examine the leaf camouflage butterfly from the case as a class, and have a discussion about camouflage. How do you think this butterfly’s appearance helps it to survive in the wild? Talk about how different environments have different colors and textures (such as foliage shapes or tree barks). In order to hide in these habitats, the creatures that live in them need to have colors and shapes that match.
- 2** Have students design a realistic habitat for their butterfly by drawing a forest, a desert, or an urban setting (in color) on a piece of construction paper.

- 3** Hand out copies of the Butterfly Camouflage worksheet. Have students color the upperside of their butterfly to blend in with the environment they drew for it. The underside should be designed to show off with bright colors and strong patterns.
- 4** Have students cut out their finished butterflies and glue the two sides together (back to back) with a craft stick in between them as a handle.
- 5** Organize the students to play a hide-and-seek game. One at a time, have each student hold up the habitat they drew with their butterfly in front of it. See if the other students can identify the butterfly from across the room. Have students describe what made it easy or difficult to find the butterflies within their habitats. Then have students flip over their butterfly sticks to show the bright and colorful underside!

Discussion Questions:

- What types of camouflage were used to disguise the butterflies in the classroom?
- What type of camouflage was the best for hiding butterflies?
- How does this type of camouflage help butterflies to survive?
- Why would it be good to be scary and to not blend in?
- What examples of camouflage can you identify from the butterfly specimens in the case?

See page 25 for details on how this activity meets New York State Learning Standards.

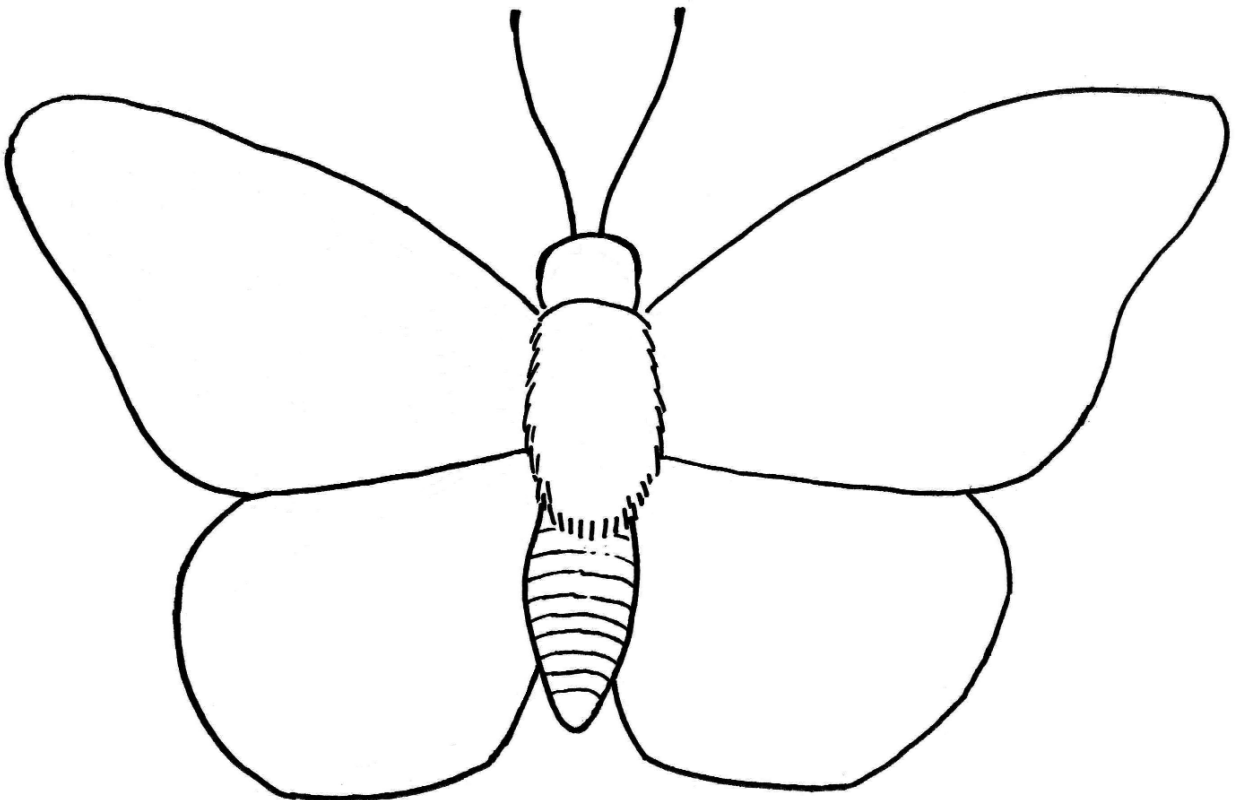
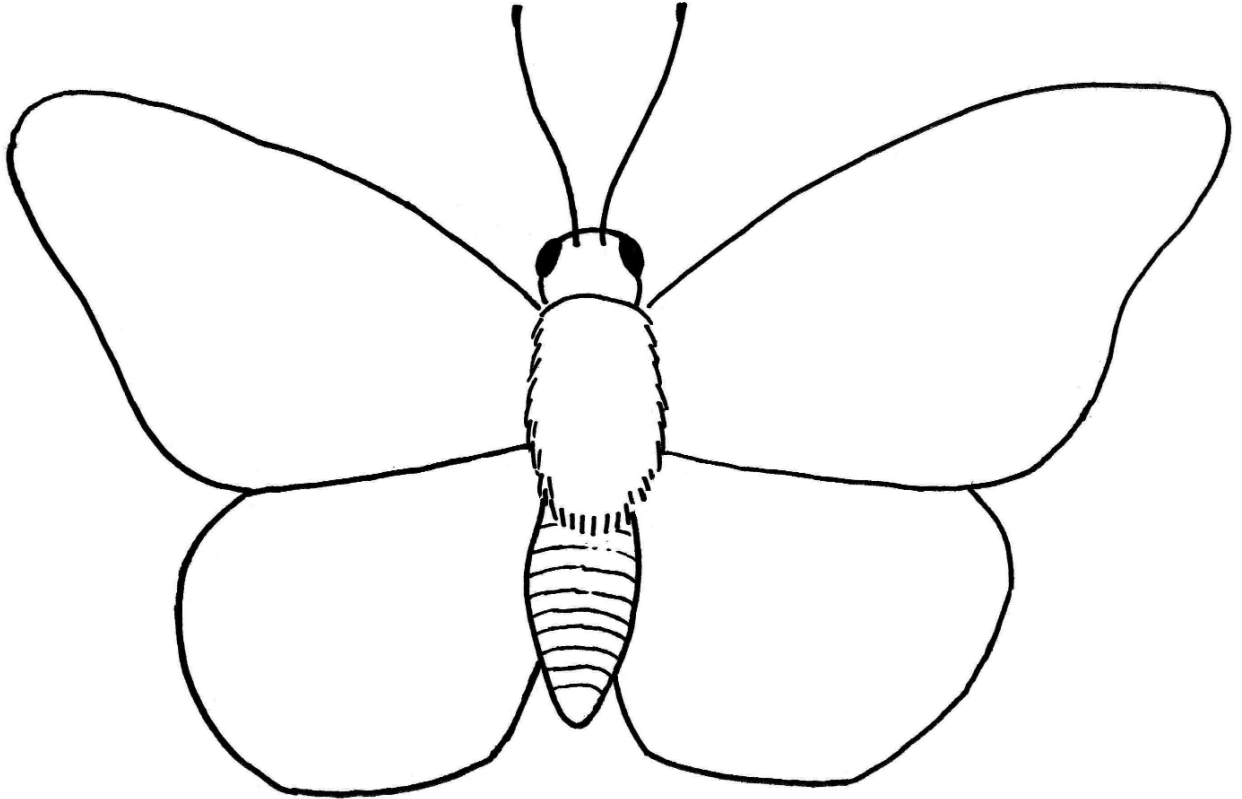


LITERACY EXTENSION: GRADES 2–4

Have students write a short story in which their butterfly introduces and describes itself, or describes a typical day in its life. Students may make up the story entirely from their own imaginations, or older students may conduct library or Internet research to make their story as factually accurate as possible.

Butterfly Camouflage

Camouflage protects a butterfly from predators by helping it blend in with its environment. Color the upper side of the butterfly so that it can blend in with the environment you have drawn for it. Then color the underside of the butterfly with a bright or wild design!



ACTIVITY 6

Raise Butterflies in the Classroom

All Grades

Related Specimens: All

The transformation of a caterpillar into an elegant butterfly is one of the visible miracles of nature. Participating in this lifecycle process can provide your students with a memorable classroom experience and a valuable lesson in science. It can be a wonderful culminating (or, if you prefer, introductory) activity for your butterfly curriculum unit.

And surprisingly, it is relatively easy, clean, and cheap to do!

Materials:

- A kit for growing butterflies. Kits usually contain a colorful habitat, butterfly larvae, special food, a feeding kit, and complete instructions. Kits can be purchased from any number of suppliers. We list some here; an Internet search on “butterflies” will provide other options. “butterflies” will provide other options.
www.insectlore.com
www.butterflywebsite.com/resource/index.cfm
www.butterflynursery.com
- Paper
- Yarn
- Hole punch
- Hand lenses
- Rulers
- Optional web resource: See www.teacherwebshelf.com/classroompets/ for a teacher’s advice on raising butterflies in the classroom.

What To Do:

- 1** Explain that the class is going to be raising live butterflies. Go over the stages of the butterfly lifecycle using the butterfly lifecycle plastmount, the lifecycle poster and model in the case, and/or the mobiles your students have made. Talk about what the students’ role will be. You may want them to help with feeding and cleaning, or you may simply want them to observe and record what is happening.

- 2** Set up the butterfly environment, getting students to help as much as possible.
- 3** Have the students make butterfly journals by folding several sheets of paper in half and tying them together with yarn through two holes along the fold. They can decorate the cover with a picture of a caterpillar or with a drawing of the butterfly life cycle.
- 4** Have students observe the butterfly environment at regular intervals and record in their journals (in writing and/or drawing) what they see happening.
- 5** When the butterflies hatch, take your students to the schoolyard for a ceremonial release.

Discussion Questions:

- What do butterfly eggs look like before they hatch? What do they look like afterwards?
- Observe how the eggs change color before hatching.
- Observe how the caterpillar’s features change as it grows.
- Keep track of the caterpillar’s growth by measuring it.
- Observe the caterpillar’s behaviors (eating, spinning, moving, and so on).
- Describe the chrysalis. What color is it? What texture? What is it for?
- Does the chrysalis move? How?
- Watch the butterfly emerge. How does it get out? What happens first? What happens next?
- How does the newly emerged butterfly look? What does it do?
- What does the chrysalis look like after the butterfly has left it?
- Observe the butterfly’s behaviors (drinking, fanning its wings, mating etc.).
- Watch for the proboscis as the butterfly drinks.

See page 25 for details on how this activity meets New York State Learning Standards.

ACTIVITY 7

Additional Activities for Older Students

Arts: Butterfly symmetry

Grades 2–4

A unit on butterflies offers you a good opportunity to teach your students about symmetry. Provide your students with a piece of paper with an outline of a butterfly on it (see page 21 for an example). Have them paint one half of the butterfly, and then fold the paper along its vertical axis and press the two halves together firmly. Unfold the papers to see how the pattern from one half of the butterfly has transferred its mirror image to the other half.

English Language Arts: Write a haiku

Grades 2–5

Have students write a haiku about butterflies. The haiku is a Japanese poetry form that does not rhyme. Each poem has with three lines and seventeen syllables: the first line contains five syllables, the second line contains seven syllables, and the third contains five syllables. Haiku are often about something from nature. Here are two examples:

A Painted Lady
Emerges to warm sunlight
Stretches wings and flies.

Thistle and nectar
Delicious treats for insects
Nature's offerings.

After students write their haiku poems, they may share their work by reading it out loud in front of the class. They may also draw pictures to go along with their poem.

Arts and English Language Arts:

Butterfly lifecycle chart

All Grades

Have each student divide a piece of paper into four boxes. Starting at the upper left and proceeding in a clockwise sequence, have the students write "egg," "caterpillar" (or "larva"), "chrysalis" (or "pupa"), and "butterfly." Then they should draw each of these stages in the designated box. Older children can also write a sentence or two about what happens to the butterfly in each stage. For younger children, you may want to provide the paper with the boxes already drawn and numbered in sequence, with underscores for each letter of the word you want them to write. They can then draw the different stages of development and label them, copying the words if necessary.

Science: Start a butterfly collection

Grades 2–5

If your students are interested in collecting butterflies, you can get them started by encouraging them to search for specimens around the school or their homes, or in nearby parks. (It is important to keep in mind that sometimes specimen collecting is forbidden in parks and other public places. Please make sure to check for any restrictions before you take your students out on a butterfly hunting expedition.) You will need equipment like butterfly nets and jars. See www.entomology.unl.edu/tmh/ent115/labs/collecting.htm for more information about how to collect and preserve your specimens.

Science: Start a butterfly garden

Grades 2–5

Start this activity early in the spring! Check with your school to see if there is ground available in the schoolyard to plant a small butterfly garden. Have your students perform library or Internet research to find out what butterflies are native to your area, and what plants those butterflies will need to eat or lay their eggs. (See www.butterflywebsite.com/butterflygardening.cfm for guidelines about choosing your garden's location, and for a list of common butterflies and their favorite plants.) Plant a selection of flowers and small bushes (this is also a good activity for teaching your students about plant lifecycles and plant care), and wait for the caterpillars and butterflies to start visiting!

See page 25 for details on how this activity meets New York State Learning Standards.

Vocabulary Words

abdomen:

the hind part of the body on the caterpillar and the butterfly.

antennae:

a butterfly's sensory appendage or "feeler," located on the head. Butterflies use their antennae to taste the air, and to help with their balance and orientation.

arthropod:

(Latin for "jointed foot") any animal that does not have a backbone, has a hard skeleton on the outside of its body, and has bendable jointed legs.

camouflage:

protective coloring that helps an animal hide by blending in with its environment.

caterpillar:

the larval stage of a butterfly or moth.

chrysalis:

the hard shell covering the pupa, shaped like an upside-down teardrop.

compound eyes:

an insect's large eyes, which are made up of thousands of tiny lenses that help the butterfly see in all directions, and recognize color, pattern, and movement.

entomologist:

a scientist who studies insects.

habitat:

the place where a plant or animal normally lives and grows.

insect:

any arthropod that has two antennae, three separate body sections, four wings (in most cases) and six legs in its adult stage.

joints:

located between the butterfly's leg segments, joints help the butterfly bend and move the body.

larva:

the second stage of butterfly metamorphosis; another term for caterpillar.

lepidopterist:

a scientist who studies butterflies.

mandible:

the caterpillar's jaw.

metamorphosis:

the process of developmental change from one thing into another (in the case of the butterfly, from egg to larva to pupa to adult).

migrate:

to travel from one place to another, often seasonally.

molt:

to shed one's skin. Caterpillars molt as they grow.

nocturnal:

active at night.

proboscis:

a butterfly's long, tube-like mouth, which works like a drinking straw that the butterfly may coil up when not in use.

pupa:

the third stage of butterfly metamorphosis; another name for the chrysalis.

symmetry:

a figure has symmetry if it can be divided into two identical halves which are mirror images of each other.

thorax:

the three front segments of the caterpillar's body (each segment with a pair of legs), or the front segment of the adult butterfly's body.

■ RESOURCES AND REFERENCE MATERIALS ■

Correlations with New York State Learning Standards

The activities included in this guide meet the following New York State Learning Standard Performance Indicators for elementary students (K-5):

New York State Learning Standard Performance Indicators (Elementary Level)					Activity						
Standard Area	Standard #	Subject	Letter	Students will	1	2	3	4	5	6	7
Arts	1	Visual Arts	a	Experiment and create art works, in a variety of mediums (drawing, painting, sculpture, ceramics, printmaking, video, and computer graphics), based on a range of individual and collective experiences	•	•	•		•	•	•
English Language Arts	1	Listening & Reading		Gather and interpret information from children's reference books, magazines, textbooks, electronic bulletin boards, audio and media presentations, oral interviews, and from such forms as charts, graphs, maps, and diagrams			•		•		
ELA	1	Listening & Reading		Ask specific questions to clarify and extend meaning	•	•	•	•	•	•	•
ELA	1	Speaking & Writing		Present information clearly in a variety of oral and written forms such as summaries, paraphrases, brief reports, stories, posters, and charts		•		•	•	•	•
ELA	1	Speaking & Writing		Use details, examples, anecdotes, or personal experiences to explain or clarify information	•	•		•	•	•	•
ELA	1	Speaking & Writing		Observe basic writing conventions, such as correct spelling, punctuation, and capitalization, as well as sentence and paragraph structures appropriate to written forms	•	•		•	•	•	•
ELA	2	Speaking & Writing		Create their own stories, poems, and songs using the elements of the literature they have read and appropriate vocabulary				•			•
ELA	2	Speaking & Writing		Observe the conventions of grammar and usage, spelling, and punctuation	•	•		•	•	•	•
ELA	4	Speaking & Writing		Listen attentively and recognize when it is appropriate for them to speak	•	•	•	•	•	•	•
ELA	4	Speaking & Writing		Take turns speaking and respond to other's ideas in conversations on familiar topics	•	•	•	•	•	•	•
Math, Science, & Technology	1	Scientific Inquiry		Ask "why" questions in attempts to seek greater understanding concerning objects and events they have observed and heard about	•	•	•	•	•	•	•
MST	1	Scientific Inquiry		Question the explanations they hear from others and read about, seeking clarification and comparing them with their own observations and understandings	•	•	•	•	•	•	•
MST	1	Scientific Inquiry		Develop relationships among observations to construct descriptions of objects and events and to form their own tentative explanations of what they have observed	•	•	•	•	•	•	•
MST	1	Scientific Inquiry		Carry out their plans for exploring phenomena through direct observation	•	•		•		•	•
	1	Scientific Inquiry		Organize observations and measurements of objects and events through classification and the preparation of simple charts and tables					•	•	•

■ RESOURCES AND REFERENCE MATERIALS ■

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New York State Learning Standard Performance Indicators (Elementary Level)					Activity						
Standard Area	Standard #	Subject	Letter	Students will	1	2	3	4	5	6	7
MST	1	Scientific Inquiry		Share their findings with others and actively seek their interpretations and ideas	•	•		•		•	
MST	1	Scientific Inquiry		Adjust their explanations and understandings of objects and events based on their findings and new ideas	•	•	•	•	•	•	•
MST	4	The Living Environment		Describe the characteristics of and variations between living and nonliving things	•	•	•	•	•	•	•
MST	4	The Living Environment		Describe the life processes common to all living things			•			•	•
MST	4	The Living Environment		Describe how the structures of plants and animals complement the environment of the plant or animal			•	•	•	•	•
MST	4	The Living Environment		Describe the major stages in the life cycles of selected plants and animals			•			•	•
MST	4	The Living Environment		Describe basic life functions of common living specimens			•			•	•
MST	4	The Living Environment		Describe how plants and animals, including humans, depend upon each other and the nonliving environment			•		•	•	•

Corresponding Field Trips

You can visit live butterfly gardens at:

Butterfly Conservatory at American Museum of Natural History

Central Park West at 79th Street, Manhattan
(212) 769-5100
www.amnh.org

Butterfly Garden at Bronx Zoo

2300 Southern Boulevard, Bronx
(718) 367-1010
www.bronxzoo.com

You can purchase butterfly specimens at:

The Evolution Store

120 Spring Street, Manhattan
(800) 952-3195
www.TheEvolutionStore.com

Maxilla & Mandible, Ltd.

451 Columbus Avenue (at 81st Street), Manhattan
(212) 724-6173
www.maxillaandmandible.com

Top spots for butterfly watching around New York City (as reported by the North American Butterfly Association):

Floyd Bennett Field: Take the 2 train (also the 5 train at rush hours) to Flatbush Avenue. Take the Q35 bus to the park. Ask the driver to let you off at the main entrance and walk past the barracks to the open areas. Common Checkered-Skippers, Checkered Whites and Pipevine Swallowtails are sometimes here in August and September. Black Swallowtails can be common along with Common Buckeyes and Red-banded Hairstreaks on the sumac blossoms.

Prospect Park/Brooklyn Botanical Gardens:

Take the 2 or 3 train to Grand Army Plaza. Climb Prospect Park's Lookout Hill (the highest point in Brooklyn) in late May to find Black Swallowtails, Red Admirals and American Ladies. The Botanical Garden right next to Prospect Park has seen Pipevine Swallowtail caterpillars on the pipevine plants and White M Hairstreaks on the buddleia and ice-plants.

Jamaica Bay: Take the A train to Broad Channel Station. Walk along Noel Road to Cross Bay Boulevard, turn right and walk about three quarters of a mile to the Refuge Visitor Center. Almost 70 species have been recorded at Jamaica Bay. Some fairly common species here are Black Swallowtail, Question Mark, Eastern Tailed-Blue, Pearl Crescent, Swarthy Skipper and the two common sulphurs of the Northeast, the Clouded and Orange.

Bibliography and Web Resources

The following books and websites may help you to enrich your experience with the objects in the case.

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Heiligman, Deborah. From Caterpillar to Butterfly. New York: Harper Collins, 1996.

Hines, Anna Grossnickle. Miss Emma's Wild Garden. New York: Greenwillow Books, 1997.

Opler, Paul A. Peterson First Guide to Butterflies and Moths. Boston: Houghton-Mifflin, 1994.

Ryder, Joanne. Where Butterflies Grow. New York: Puffin, 1996.

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Yoshi. The Butterfly Hunt. Saxonville, Massachusetts: Picture Book Studios, 1990.

Butterflies and Moths:
www.butterflies-moths.com

The Butterfly Website:
www.butterflywebsite.com

Gardening for Butterflies:
www.familyofnature.com/gardenbutterflies.htm

Monarch Watch:
www.MonarchWatch.org

U.S. Geological Survey, Butterflies of North America:
www.npwrc.usgs.gov/resource/distr/lepid/bfly-usa/bflyusa.htm

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Brooklyn Children's Museum
145 Brooklyn Avenue
Brooklyn, New York 11213
718-735-4400 ext. 170
www.brooklynkids.org

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