Puelicher Butterfly Wing 360 Virtual Tour Script

Note: Black font is used to denote physical labels in the museum. Blue font is used to denote text from our virtual 360 tour.

Introduction

Welcome to the *Puelicher Butterfly Wing*. This gallery focuses on butterflies, but also covers other animals in the arthropod phylum. The arthropod phylum is the largest of the animal phyla. Learn more from our *Puelicher Butterfly Wing* Supervisor, Jon Bertolas.

Jack Puelicher Butterfly Garden

Jack Puelicher

[Exhibit Label]

November 4, 1920-October 30, 1999

A Living Memorial

In death, there comes the gift of new life.

All of life's diverse creatures are molded from the same living clay.

In death, the creative elements of this life substance are reshuffled but not lost.

The strong, tough, but elegant tree grows and flourishes because the Earth is rich with the substance of life.

Through the living tree's forthright branches and shimmering leaves, we celebrate that sometimes crusty coat, but always warm and truly generous heart of Jack Puelicher, and his many, many good deeds to humanity and the rest of nature.

In reaching into the heart of the living tree, we discover solitude, peace, and hope for new life yet to be.

There will never be another Jack Puelicher, but indeed he lives on, through autumn, winter, spring, and summer, embodied in the very essence of the living tree.

-Allen M. Young, November 1, 1999, Milwaukee, WI

Transformation Station

The word “vivarium” refers to enclosed areas that mimic the natural conditions of animals kept inside. At MPM’s *Vivarium*, we rotate among over 50 species of butterflies. The butterflies are brought to MPM as chrysalises, which are then hatched in this special chamber.

Butterfly Livestock - A gift from Northwestern Mutual Foundation

A poster displays information on some of the butterflies in the *Vivarium*. A selection has been chosen for focus below.

Blue morpho butterfly

Range: Central and South America

Diet: Rotting fruit

Visitors will notice plates of fruit throughout our *Vivarium* for the blue morpho and other frugivores (fruit-eaters) to feed on. The underside of the blue morpho’s wing is brown for camouflage with numerous “eye spots” to intimidate predators.

Giant owl butterfly (Caligo eurilochus)

Range: Central and South America

Diet: Nectar and rotting fruit

Giant owl butterflies get their name from the spots on their eyes that look like an owl’s eyes.This adaptation confuses would-be predators.

Starry night cracker (Hamadryas laodamia)

Range: Central and South America

Diet: Rotting fruit, tree sap, and animal dung

The butterflies of the *Hamadryas* genus are known as crackers, because the males can create a crackling sound with their wings for mating purposes. However, the starry night crackers found in our *Vivarium* are the only one of the genus that do not make this sound. Starry night crackers get their name from the Van Gogh painting *Starry Night*.

Common postman (Heliconius melpomene)

Range: Central and South America

Diet: Pollen and Nectar

The colors of the common postman are a warning to predators that they are poisonous to eat. The species is called “postman” because they will visit the same flowers in the same order every day, just like a mail carrier going from house to house.

Paper kite (Idea leuconoe)

Range: Southeast Asia and Northern Australia

Diet: Nectar

This butterfly has three frequently used “common names.” It is called paper kite butterfly, rice paper butterfly, and large tree nymph butterfly in different parts of its habitat.

Identified species often have two types of names: their scientific name and their common name. Scientific names are important in research, because it is a name the worldwide scientific community has agreed upon, so scientists are clear what species is being referred to in research. However, many species have a different “common” name depending on the culture in the area it is located. A local example of this is the pill bug, which is also called a roly poly or doodlebug.

Common mormon (Papilio lowi)

Range: Indonesia and the Philippines

Diet: Flower Nectar

Like many species, the males and female common mormon look very different from each other. The larvae feed on the leaves of citrus plants.

Malachite (Siproeta stelenes)

Range: Central America, South America, Florida, the Caribbean and Southern Texas

Diet: Rotting fruit, nectar, and animal droppings

This butterfly is named after the mineral malachite because of its vibrant green color.

Watch Caring for Our Live Plant Collection

Thanks for visiting the *Vivarium*! Now that you’ve learned about some of our butterflies, download the PDF below to learn even more about butterfly wings and color some of your own.

Wing Coloring Page

Bugs Alive!

Major Groups of Arthropods

- **Insects**
  (32 Orders)
  Beetles and Weevils
  Butterflies and Moths
  Bees, Wasps, Ants
  Flies and Mosquitoes
  Bugs, Cicadas, Leafhoppers
  Roaches and Mantids
  Grasshoppers, Cricket and Katydids
  Dragonflies and Damselflies
  Silverfish
  Other groups including: Mayflies, Earwigs, and Termites
- **Arachnids**
  Spiders
  Scorpions
  Mites and Ticks
  Harvestmen
  Tailless Whipscorpions
  Pseudoscorpions
  Vinegaroons and other groups
- **Millipedes**
- **Centipedes**
- **Crustaceans**
  Crayfish
  Lobsters
  Crabs
  Shrimps
  Sowbugs
  Barnacles
  Water fleas and others
- **Others**
  Horseshoe Crabs
  Symphyla
  Sea Spiders
  Sea Scorpions (extinct)
  Trilobites (extinct

Arthropods

Why are Arthropods so successful?

Arthropods are the most dominant form of life on Earth. They feed on plants, other animals, and fungi, and also support large numbers of organisms higher on the food chain. They pollinate plants, aerate the soil, and help recycle nutrients. In fact, life as we know it, including human life, would cease to exist without arthropods.

What makes them so successful? Here are a few of their secrets:

Exoskeleton - Having a strong but lightweight external skeleton provides support and protection, prevents water loss, and is highly adaptable for structures ranging from delicate wings and egg cases to strong mandibles and claws.

Small size - Allows arthropods to partition the environment into numerous microhabitats and specialize in occupying them, thus more small than large individuals can live in the same space. Smaller animals often grow faster, need less food, and can disperse or hide more easily.

Metamorphosis - Adults and juveniles are often active at different times, occupy different habitats, or use different foods-eliminating competition between them.

Flight - The ability to fly occurs in only one group of arthropods: insects. Insects are the most successful group of arthropods on land. Those that fly are generally more diverse (more species). Flight is used for all aspects of survival and to colonize new habitats.

Cold-blooded - This feature allows arthropods to survive in harsh environments, eat less food, and respond more quickly to changes in weather. A cold-blooded animal converts about 60% of its food into biomass, far more than warm-blooded animals.

Rapid reproduction - Under favorable conditions, many arthropods can produce large numbers of offspring in a relatively short period of time.

Diversity

You can study the diversity of arthropods just like a real entomologist (a person who studies insects)! Download our Insect Observation sheet to learn how.

Diversity reaches its zenith with the beetles. There are more species of beetles known (over 350,000 different kinds) than for any other group of organisms-and based on the rate new species are being found, we know that most of the beetles have not yet been discovered.

Beetles probably make up at least half of all animal species.

With the exception of Antarctica, beetles are found throughout the world, but are most numerous in the tropics. They range in size from 0.3 mm long (minute featherwing beetles) to over 15 cm long (Titanus giganteus). Their lifestyles are highly varied, but the majority feed on plants.

Beetles

Beetles and bugs - Both are insects, but how do you tell them apart?

(Hint: look at their mouths)

Beetles have

- Mouthparts for chewing
- Thick forewings covering thin membrane-like hindwings used for flight

Bugs have

- Mouthparts for piercing and sucking
- All wings similar, held tent-like or overlapping (forewing base may be thicker)

[Terrarium Label]

Scientific name: Eudicella smithi
Common name: Jade-headed buffalo beetle
Locality: Africa

Habitat: Tropical forests
Behavior: Grubs develop in rotting logs, compost, or dung. Adults feed on pollen, tree sap, and fruits. They can be trapped along the forest edge using rotten bananas.

Bugs

Beetles and bugs - Both are insects but how do you tell them apart?

(Hint: See how they grow)

Bugs have three stages of development (gradual metamorphosis)

Egg-nymph (similar to the adult) - adult

Other insects with this life cycle include termites, grasshoppers, walking sticks, and cockroaches.

Beetles have four stages of development (complete metamorphosis)

Egg-larva (grub) - pupa - adult

Other insects with this life cycle include butterflies, ants, wasps, and flies.

[Terrarium Label]

Scientific name: Platymeris biguttata
Common name: White-eyed or two-spot assassin bug
Locality: Congo and other portions of East and West Africa
Behavior: As its name implies, this is a fierce predator. It pounces on insect prey and uses its sharp needle-like mouth parts (proboscis) to impale them, inject venom, and suck out the body fluids.

Besides being equipped with a painful bite, this bug can spray venom from the end of its abdomen. Purpose? An excellent defense when sprayed into the eyes of vertebrate predators.

Note: Many predatory bugs can extend their proboscis forward from the front of their heads unlike cicadas and other bugs that feed on plants.

Arthropod Scents

Arthropods use odors to locate their mates and find host plants on which to lay their eggs. They also produce strong odors to avoid being attacked by predators.

Some arthropod chemical weaponry includes odors that are very unpleasant, while others produce smells that can be considered delightful to humans.

Citronella ants emit a pleasant smell as detected by humans albeit irritating to smaller predators. The term “citronella ant” can refer to multiple species of ant in the genus *Lasius*. They range in color from bright yellow to orange. Shown above are a specimen and enlarged model of a North

American species.

Some of these fragrant compounds also warn others danger is near. These smells are known as “alarm signals” and can be released quickly and are often used by arthropods living in groups.

Citronella ant colonies are secure because they are underground. However, if an intruder manages to enter the nest, the ants release a chemical to help protect them from being eaten as well as alert fellow ants of the intrusion.

Watch Arthropod Aromas

Citronella Ant

Scientific name: Lasius interjectus

Locality: Throughout the United States, most common in eastern United States

Defensive odor: Citronella ants produce a lemon or citrus smell to defend themselves against predators and warn others in their colony of danger.

Cherry millipede

Scientific name: Apheloria virginiensis

Locality: Eastern United States and Canada

Defensive odor: Under threat, some cherry millipede species spray a fluid that smells like cherry Cola.

Peppermint stick insect

Scientific name: Megacrania batesii

Locality: Eastern Australia and islands of the Pacific Ocean

Defensive odor: The peppermint stick insect releases a white, minty-smelling substance when disturbed.

Stink bug

Scientific name: Halyomorpha halys

Locality: Native to eastern Asia, recently introduced to the United States and other countries

Defensive odor: Stink bugs have defensive glands on their undersides that secrete substances that smell musty or coriander-like when startled.

Giant vinegaroon or whip scorpion

Scientific name: Mastigoproctus giganteus

Locality: Mexico and southern United States

Defensive odor: In order to defend themselves, whig scorpions spray a substance from the base of their tails comprised of acetic acid, hence the vinegar smell.

Shore earwig

Scientific name: Labidura riparia

Locality: Worldwide, often tropical and subtropical regions

Defensive odor: Earwigs are known to smell of rotting and/or decaying matter, especially when under attack.

Arthropod Scents

[Exhibit Label]

Many arthropods produce smells that are distasteful or noxious to natural enemies. These odors can be very repulsive when encountered, even to unintended targets like people.

A stink bug is an example of a commonly encountered insect that deploys a nasty odor when threatened. “Stink bug” is a common name applied to many in the family Pentatomidae. Regardless of the species, exactly what these smells represent is in the nose of the beholder, and can range from “skunky” to “musty” to coriander.

Representative stink bug species from the Milwaukee Public Museum Invertebrate Zoology Collection are shown.

Like many other arthropods, stink bugs release these foul-smelling chemicals from scent glands which can be located on the top, sides, or underside of their bodies.

Other arthropods, such as millipedes, release defensive odors from structures called ozopores, which are located on many body segments.

Social Insects

All termites, ants, and some bees and wasps are Social Insects. What does this mean? Social insects live in groups, cooperate in caring for their young, have specialized reproduction (only queens mate and lay eggs), and generations overlap so offspring assist their parents with work in the nest.

Ant workers are all females. Termite workers are both males and females.

The result has been a tremendous success! Ants and termites make up an estimated 25% of the total biomass of all the animals living on land.

Communication occurs primarily with chemical signals, but some species also use touch, visual signals, and sound, especially vibrations along surfaces. These signals influence a wide range of behaviors and even caste (differences in appearance and/or roles of individuals within the colony).

Wasps, bees, and ants are closely related. Some live in groups (social), others live alone (solitary). Most construct a nest to protect their young. Nests are made using wood pulp, plant saps, mud, rolled leaves, or other materials. Nests can be underground, in wood, suspended high in trees, and in or on buildings.

Wasp Nest

Yellowjacket wasps including the bald-faced hornet build large, enclosed paper nests in protected hollow spaces, against buildings, or suspended from branches. Adults eat nectar, juices of rotting fruit, and animal carcasses. Their powerful sting is used to kill caterpillars and other insects to feed to their young. They can also sting intruders multiple times when defending their nest.

Many bees and wasps are brightly colored with red, orange, or yellow. What do their colors tell you? They are warning, "Beware—I sting!"

Some brightly colored insects, other than wasps, are advertising that they taste bad or are poisonous to predators.

A third but much smaller group are imposters. Even though they are harmless, their bright colors mimic the patterns of insects that sting or are distasteful. This gives them an extra measure of protection.

Flight

To fly, -flies, and "true flies"

Insects were the first animals to fly. This ability is one of the reasons insects are so successful. They fly to escape from predators, go to mates, move to new habitats, and get food. Flight is also reflected in what we call them—mayflies, dragonflies, fireflies, stoneflies and true flies— to name just a few.

Dragonflies and damselflies have short antennae and large eyes (dragonfly eyes are set close together, damselfly eyes are separated like a dumbbell). They are predators of mosquitoes and other flying insects that live near water. They can bend their long abdomens around, but will never hurt you —they don't have stingers!

Fireflies are actually beetles. Each kind produces its own signature flash pattern. Males signal to females and females flash back in response. They breed in moist, marshy habitats where their larvae feed on earthworms, snails, and slugs.

Walking Sticks

Walkingsticks are masters of camouflage. They not only look like twigs and leaves but "act" like them too-hanging motionless or moving slowly as if swaying in the breeze so as not to attract attention.

Walkingsticks feed on the leaves of various trees. The females lay single eggs that fall to the ground. When conditions are right, the eggs hatch and the young stick insects move back up onto the vegetation.

[Terrarium Label]

Scientific name: Extatosoma tiaratum
Common name: Giant prickly walkingstick
Locality: Coastal Queensland, Australia.
Habitat: Rainforest and other habitats, feeding on eucalyptus trees
Behavior: Newly hatched nymphs resemble ants. They come out running and head upward for the first few days of life. Only those that make it up into the trees have any chance of surviving.

Stick insects are sometimes confused with a different group, the praying mantids. Mantids prey on other insects. They sit quietly, watching and waiting, front legs folded - almost as if praying - until a victim comes in range of their lightning-quick grasp.

Insect Sounds

Grasshoppers, katydids, locust and crickets are closely related. They have long back legs for jumping, and chewing mouthparts for eating plants or sometimes other insects. Some look like leaves. These insects are especially well known for their seasonal serenades.

Many grasshopper and cricket males "call" to females by rubbing rasps on one wing against ridges on the opposite wing. (Hint: like moving your thumb along the teeth of a comb).

All insects sing more slowly as the temperature decreases.

Cicadas, though sometimes called locusts, are not locusts or grasshoppers. They belong to a group of insects called true bugs. Male cicadas produce clicking sounds when muscles contract and release two thin membranes, called tymbals, on the sides of their bodies.

Cockroaches

Cockroaches live throughout the world but are most common in warm, moist places. They cluster in hiding spots by day and scavenge for food at night. Because they eat a wide range of foods—from fallen fruit to dead insects and bat guano—they are important nutrient recyclers. Scorpions, spiders, monkeys, and many other animals eat cockroaches.

The giant cockroach, *Blaberus giganteus*, from Central and South America, is one of the largest species.

[Terrarium Label]

Scientific name: Gromphadorhina portentosa
Common name: Hissing cockroach
Locality: Native to Madagascar
Behavior: Produce a hissing sound when disturbed by pushing air out of their spiracles (body openings used for breathing)

Unlike many other cockroach species, these do not have wings and can't fly.

Males have “horns” used for pushing when fighting over space or females.

Note: Some have small, light-colored mites on their bodies. The mites cannot survive off their hosts. They feed on food scraps and saliva from the roaches but don’t harm them.

Insect/Arachnid Comparison

Learn about insects and arachnids in the video below. Then, download our Insect vs. arachnid resource to create your own.

Insect vs Arachnid Video

Insect vs. Arachnid PDF

How do you tell an insect from an arachnid?

It's all in the plan—the body plan, that is.

Insects have:

- 3 main parts—head, thorax, and abdomen
- 6 legs
- 1 pair of antennae

Most insects have four wings (flies have two, fleas have zero), compound eyes (eyes with many lenses), and simple eyes (to detect light and dark). Insects have mouthparts adapted for biting, chewing, lapping, or sucking up liquids to meet different lifestyles. Most insects are predators (feeding on other animals), herbivores (feeding on plants), or scavengers (feeding on dead organisms).

Arachnids have:

- 1 or 2 main body parts—cephalothorax and abdomen, or both together
- 8 legs
- no antennae
- no wings

Arachnids have zero to six pairs of eyes (no compound eyes). Most arachnids are predators and have evolved specialized pincers, poison fangs, or feelers suited for their lifestyles.

Spiders

Spiders are the second most-diverse group of arachnids with over 35,000 described species. All spiders are predators and have jaws with fangs for injecting venom and sucking liquids.

An accidental bite by a black widow spider can be serious. However, most arachnids are harmless to people, and the role of spiders is critical for the balance of nature.

Spiders have evolved numerous ways to catch prey, from using webs to ambush. Jumping spiders have very large eyes and excellent vision. Active in the day, they hunt their prey by sight and pounce on it. They also use visual displays to signal to mates. Watch Jumping Spider Video

[Terrarium Label]

Scientific name: Avicularia versicolor
Common name: Antilles pink-toe tarantula
Locality: Antilles Islands in the Caribbean
Habitat: An arboreal (tree-dwelling) species builds a silk retreat in the forest canopy where it hides during the day; hunts for insects and other prey at night
Note: All spiders can produce silk. Silk comes out of the spinnerets as a liquid protein that hardens immediately. It is very strong but has lots of stretch. Different glands produce different kinds of silk (some is sticky).

Scientific name: Grammostola rosea
Common name: Rosehair or Chilean rose tarantula
Locality: Northern Chile, Bolivia, Argentina
Habitat: Dry, arid scrub desert
Behavior: Moves around in the wild (nomadic tarantula), hiding in hollow areas under rocks

Some individuals are pinkish and others are more brown in color.

Tarantulas' jaws (chelicerae) move up and down. The chelicerae move from side to side in many other spider groups.

Tarantulas are the largest spiders; most live on the ground, some burrow into the soil, others live in trees. All hunt at night using touch or vibrations to find prey.

Other Arachnids

Other arachnids, in addition to spiders and scorpions include ticks and mites, whip scorpions, and tailless whip scorpions. Found in nearly every habitat worldwide, arachnids reach their greatest diversity in warm places, both dry and humid.

Mites are the most abundant arachnids in number of species and individuals— 45,000 species have been described by scientists, only about 5% of the total number estimated to exist. They range in size from tiny to microscopic. Some feed on plants, some live in water, and others are parasites on insects, bird feathers, or even us!

Ticks are a subgroup of parasitic mites with specialized mouthparts for feeding on the blood of reptiles, birds, and mammals.

[Terrarium Label]

Scientific name: Mastigoproctuc giganteus
Common name: Giant vinegaroon or whipscorpian (This is the largest species)
Locality: Southern United States
Habitats: Burrows in sand, or hides under logs during the day
Behavior: Vinegaroons can spray vinegar-like mist for defense.
Four pairs of legs - front pair used as feelers; pincers used to capture prey

Scientific name: Damon diadema
Common name: Tanzanian giant striped tailless whip scorpion
Locality: Tanzania, eastern Africa
Behavior: Predator of insects, spiders, etc. at night, hides under stones or bark by day, scurries sideways very quickly when disturbed
Note: Whip Scorpions do not have stingers and are not true scorpions. Newborn whip scorpions are carried on the back of their mother.

Scorpions

[Exhibit Label]

Scorpions are arachnids, related to spiders. Scorpions are easy to recognize by their elongated body, large pincers, and segmented tail with venomous stinger. They live in deserts, grasslands, forests, caves and even at high elevations in the Andes and Himalayan Mountains.

An unusual feature of scorpions is that they glow under ultraviolet light. The light is absorbed by the scorpion's body and reflected back as a yellowish-green glow. Biologists use UV to find scorpions at night. Walking along and holding a UV light close to the ground, the biologist simply watches for the eerie glow.

[Terrarium Label]

Scientific name: Pandinus imperator
Common name: Emperor scorpion
Locality: Tropical western Africa
Behavior: Hide by day and hunt for insects, centipedes, and other prey at night (most scorpions have poor eyesight but detect vibrations, scents, and air movements to find prey)

Scientific name: Hadogenes troglodytes
Common name: Flat rock scorpion
Locality: Southern Africa
Habitat: Rocky crevices
Note: Of 1,300 species worldwide, only 20-50 (one in the United States) have venom that is life threatening for people

Millipedes or Centipedes?

How they compare:

Millipede means “thousand-footed” though no millipedes have that many legs. Their rounded bodies have two pair of legs on most segments, up to 375 pair for one species. These slow-moving animals, about 11,000 species worldwide, are some of nature’s best nutrient recyclers.

Centipede means “hundred-footed.” Centipedes are swift-moving predators, with flattened bodies and one pair of legs per segment. The number of legs varies by species from 15 to 191 pairs. There are about 4,000 species worldwide.

[Terrarium Exhibit Label]

Scientific name: Archispirostreptus gigas
Common name: Giant black millipede
Locality: Ghana and other parts of tropical western Africa
Habitat: Rainforests - in moist leaf litter, under bark, or in the soil (feeding on decaying plants)
Behavior: Curls into spiral and secretes smelly irritating fluid for defense.
Why so many legs? - an excellent adaptation for burrowing

Scientific name: Scolopendra heros
Common name: Giant desert centipede
Locality: Texas and southwestern United States
Habitat: Warm, dry desert regions
Behavior: Active at night and seeks shelter in moist dark areas (under stones, logs, etc.) by day; uses fangs to inject venom into insects, earthworms, and other small prey.
Note: Never handle centipedes - painful bite!

Crustaceans

Crustaceans such as Wisconsin’s native crayfish are extremely important to understand the health of our natural resources. MPM has done extensive research on crustaceans of Wisconsin, including publishing a book. Learn more about our crustacean research here.

Crustaceans include crabs, shrimps, lobsters, sowbugs, barnacles, and copepods. There are about 45,000 different kinds-from microscopic to three feet long. Most live in water and breathe dissolved oxygen through gills.

If you think crustaceans are yummy to eat, you are not alone! Krill are small shrimp-like crustaceans that move in large swarms in the ocean. The biomass of one species, the Antarctic krill, exceeds the total biomass of all the people on earth. A “keystone” species in the Antarctic food web, krill are eaten by many other animals - fish, squid, birds, and whales - and are key to their survival.

[Terrarium Label Text]

Scientific name: Procambaraus clarkii

Common name: Red swamp crayfish
Locality: Louisiana and southeastern US (but introduced into other parts of the world and causing serious ecological problems)
Habitat: Fresh and slightly salty water - rivers, swamps, irrigation ditches, or on land - burrows down to the water table when habitat gets dry
Behavior: Aggressive and territorial; diet includes fish, newts, worms, insects, snails, some plants. Active at night like most other crayfish.

This species is used in Cajun-style cooking

Crayfish (also called crawfish, crawdads, mudbugs) include about 150 North American Species

Note: Crustaceans are the only arthropods with four antennae (feelers).

Butterfly Wing

Whether you call them bugs or creepy crawlies...

Arthropods are the largest and most successful group of animals on Earth. All arthropods have an exoskeleton—a tough, outer body casing (like a suit of armor) with flexible joints. As they grow, a new exoskeleton is formed and the old one is shed (molted). This strong, protective body casing allowed arthropods to be the first animals to live on dry land.

Animals make up one of the five kingdoms of life.

Animals:

- are living organisms
- can move
- feed directly or indirectly on other organisms (can't make their own food like plants or some bacteria)
- are made of cells with particular features (for example, animal cells lack a rigid cell wall)

Cultural Expressions

What do butterflies portray to you?

Butterfly imagery has been incorporated into art, dance, literature, and folklore of different world cultures extending back through time.

Caterpillars and pupae are also eaten by people of many cultures around the world as a good source of fat and protein, medicine, or for spiritual reasons.

“Psyche” is the ancient Greek word for both “butterfly” and “soul.” In the Greek fable of Cupid and Psyche, Psyche represents the human soul, purified after suffering and misfortune, and then given the gift of pure happiness. Psyche is often depicted as a maiden with butterfly wings.

In parts of Mexico, the arrival of Monarch butterflies coincides with the Day of the Dead Celebration, so they have come to symbolize the return of departed souls.

In ancient Mexican cultures, butterflies represented fire, soul, death, warriors, and travelers.

Papilio multicaudatus is associated with the depiction of *Xochiquetzal* the goddess of love, flowers, vegetation, and fire.

Rothschildia orizaba is associated with the ferocious Aztec goddess *Itzapaplotl.*

In Brazil, dancers assume the character of a blue morpho butterfly in a dance to honor the dead.

How do you say butterfly?

In many cultures, the same word is used for both butterflies and moths. The word "butterfly" comes from the old English word *butterfloege*. It's origin is unknown, but one theory suggests it describes the common yellow brimstone butterfly, thought to resemble butter flying.

Arabic - farasha
French - papillon
Hebrew - parpar
Italian - farfalla
Korean - nabi
Philippine - paruparo
Russian - bábochka
Swahili - kipepeo
Cherokee - kamama
German - schmetterling
Hindi - titli
Japanese - chouchou
Norwegian - sommerfugl
Polish - motyl
Spanish - mariposa
Vietnamese - ho diep

Did you know?

Fun Facts

One of the most important abilities for a butterfly or moth is the ability to fly. The contraction and relaxation of opposite pairs of muscles attached to the thorax cause the wings to move like oars in a rowboat. However, the wings are not stiff. They can twist and bend in a slanted figure-eight motion that allows these animals to fly forward, backward, and to hover.

Monarchs can be so densely packed on the trees in the overwintering grounds in Mexico that sometimes a branch will break under their weight. How many monarchs does it take to make one pound? [Hint: An average male monarch butterfly weighs .56 grams or about 1/50 of an ounce. 453 grams=16 ounces=1 pound (same as four sticks of butter).] The answer is over 800 monarchs!

Wing shape makes a difference in speed and maneuverability. Broad-wing surfaces are generally better for gliding flight. Long, slender wings are for high speed and agility. You can learn to tell different species apart by observing how they fly.

Caterpillars are eating machines!

After feeding for about 15 days, a monarch caterpillar weighs more than 3,000 times its initial weight as an egg. Giant silk moth caterpillars are even bigger. Think how much eating and growing a giant silk moth caterpillar has to do.

Where do butterflies go at night?

Butterflies close their wings and take shelter under leaves or other protected spots. Some cluster together in communal roosts. Their eyes are always open since they don't have eyelids, but they don't see well under low-light conditions. Night-flying moths do have eyes that are adapted to see in the dark.

Insect eyes are about ten times "quicker" than ours. We detect individual images up to 20 per second before they blur together. Insects can detect up to 200 per second. This ability is especially important for fast flying insects like a sphinx moth... or to help a butterfly avoid being snapped up by a predator.

Most butterflies fly between one and 20 miles per hour. At more than 30 miles per hour, sphinx moths are among the fastest flying insects.

An Ancient History Window 1

Lepidoptera play a key role in the interdependency of life.

By most estimates, there are more species (unique kinds) of insects than any other living organism.

As one of the largest and most diverse groups of insects on Earth today, Lepidoptera are an important part of the food chain. They get eaten in all stages of their development by other animals.

Lepidoptera also exert a strong influence on plant diversity. Many adults pollinate flowers, and caterpillars are the largest group of plant feeders.

You can't have one without the other

In spring, a yucca plant sends out a tall spike with hundreds of night-blooming flowers. The flowers attract yucca moths. The female moth collects sticky pollen from the anthers of one flower, rolls it into a ball, and carries it to the pistil of another flower. After laying her eggs in the base of that flower, she climbs atop the stigma and pushes pollen into the tube to fertilize the flower. Later when her eggs hatch, the caterpillars are safe within the protective pod that has grown around them. They eat a portion of the developing seeds. Both yucca plants and the moths benefit from this special relationship.

How many are there?

Of the five to 30 million species of organisms estimated to be living on Earth, only about 1.4 million have been described and given scientific names.

Kinds of Living Organisms	Number of Named Species
Insects	751,000 including 170,000 Lepidoptera
Green Plants	250,000
Non-insect Arthropods	123,200
Viruses, Bacteria, Fungi, and Algae	80,000
Mollusks	50,000
Vertebrates	41,700
Worms	36,200
Protozoa	30,800
Sponges, Jellyfish, Starfish, and relatives	29,400

Ancient History Window 2

The Butterfly Lineage

Butterflies might best be thought of as recent branches on the moth family tree. Their greatest distinction is specialization in daytime activity.

For present-day Lepidoptera, 8% of known species are butterflies and the other 92% are moths. Moths also occur in greater abundance.

New species of butterflies and moths are still being discovered, especially in the tropics and remote mountainous areas.

	Butterfly	Moth
Activity Period	Day	Dusk or night
Antennae	Clubbed or hook-tipped	Straight or feathery
Wings at Rest	Upright	Flat or tent-like
Coloration	Bright	Drab

No one feature can be used to separate all butterflies from all moths.

Ancient History Window 3

Watch “Did Butterflies Live with the Dinosaurs?”

Lepidoptera have existed for millions of years

Evidence suggests ancestral Lepidoptera arose during the Triassic period about 175 million years ago, a time when land formed one "supercontinent” called Gondwana.

A few primitive moths are preserved in exquisite detail from 125 to 130 million years ago. The oldest butterfly fossils are more recent, dating back about 40 million years ago.

A fossil butterfly, **Olig-oh-dont-ah floris-ant-ten-ees** *Oligodonta florissantensis*, is from the Oligocene about 38 million years ago, excavated from the Florissant Fossil Beds National Monument, Colorado. The species was named for the time period when the butterfly lived and the location where it was discovered.

During the Cretaceous period, insects and flowering plants diversified, forming many new species. Lepidoptera certainly influenced the evolution of flowering plants, since caterpillars are one of the first groups of plant-feeders. Likewise, plants developed chemical and other defenses that shaped the evolution of moths and butterflies. Insects and flowering plants are the most dominant life forms on Earth today.

Two fossils of *Vanessa* ***Ah-merrin-deeka*** *amerindica* are from about 35 million years ago, from the Florissant Lake Bed Shales. This ancient butterfly species closely resembles some butterfly species flying today. That is why it was classified as belonging to the same genus (*Vanessa*).

Baronia brevicornis is the only surviving member of one of the oldest and most primitive lines of butterflies.

Vanessa indica is a present day relative of *Vanessa amerindica.*

Members of the Neotropical genus Leodonta are the oldest living relatives of *Oligodonta florissantensis.*

A related insect lineage

Caddisflies (order Trichoptera) are the insect group most closely related to Lepidoptera. Both caddisfly larvae and caterpillars use silk to help anchor themselves to surfaces and to make protective casings.

Butterfly Theater

The fabulously elegant Butterfly Theater built in the heart of Milwaukee at 212 West Wisconsin Avenue heralded a new era of “moving pictures” with its premiere show on September 2, 1911. Photo from the collection of Larry Widen.

Watch Preserving the Balance Video

Senses

We share the same planet, but butterflies and moths perceive the world differently than we do.

Hearing

Specialized organs for hearing occur on antennae, at the base of the wing in some butterflies, and on the mouthparts of some moths. Hearing organs are especially well developed on the bodies of medium-sized moths hunted by bats.

The moth "ear" usually consists of a drum-like structure (tympanal organ) on the thorax or abdomen that can detect the wide range of frequencies used by bats, including ultrasound.

Smell

The sense of smell is very important to butterflies and moths for locating food and mates.

Where is a butterfly's nose?

A butterfly's antennae (an-TEN-nee) have sensory cells to detect vibrations, sound, and chemical odors. Antennae also help the butterfly to maintain its balance during flight.

The female giant silk moth releases a pheromone to attract mates. Male giant silk moths have wide, feathery antennae with sensory cells that can detect the female's scent. Males can locate females up to a mile away by flying upwind and following her scent.

Many butterfly and moths produce cents called pheromones (fair-o-moans) that play a key role in mating.

The pheromones of male butterflies are dispersed via patches of specialized wing scales, called androconia (an-dro-CONE-ee-a). The size, shape, and location vary with species. (Female butterflies use their antennae to detect male scents.)

Senses

Vision

Many butterflies and moths see ultraviolet colors, and some can see infrared. Our eyes are not sensitive to these parts of the light spectrum.

Certain flowers have ultraviolet patterns that guide butterflies and other pollinators to the nectar.

How does this ability benefit butterflies?

Some butterflies use ultraviolet colors to communicate with each other. Scales on the wings of these butterflies either reflect or absorb ultraviolet light, creating color patterns that are invisible to us but the butterflies can see. These colors help butterflies recognize and signal to members of their own species.

Each compound eye is made up of 200 to 27,000 light and motion-sense units called ommatidia

(om-ma-TID-i-a). The large size and round shape of the eyes allow a butterfly or moth to see in all directions except directly beneath its body.

We have two eyes but don't see "double." The neural messages from our eyes are combined into one image by our brain.

A butterfly's brain receives signals from thousands of ommatidia, and can simultaneously integrate this information into a functional image.

The fast-flying sphinx moth uses vision to locate nectar and other resources. Vision is less important for the giant silk moth. It does not feed in the adult stage and uses chemical communication to locate a mate.

Taste

Butterflies can't "lick their fingers"but they can taste with their "feet."

Before laying eggs, female butterflies scratch the surface of leaves with their front legs to decide if the plant is appropriate caterpillar food. At the tip of the legs they have specialized cells that can sense the chemical compounds released by the damaged leaf. If chemicals "taste right," the female will lay her eggs. If not, she will fly away and search for another plant.

Chemical receptors are found on the tarsi (last segments of the legs), the antennae, and on the tip of the proboscis. These receptors allow butterflies to smell and taste food and other chemical components in plants.

Lepidoptera Activity Station

Need a moment in nature? Enjoy calming music while you observe butterflies and moths in their natural habitats.

Watch Butterflies Video

How does a butterfly breathe?

Butterflies and moths do not have lungs. Small openings in the body wall, called spiracles, allow air to flow through a delicate network of passageways to bring oxygen to tissues.

Mimicry

If a species that is not distasteful looks like a brightly colored distasteful species, its chances for survival improve.

Usually the distasteful species must be more abundant than the mimic. Vertebrate predators are then more likely to sample a distasteful butterfly and avoid others with similar color patterns.

This is called Batesian mimicry.

Mimicry and Geographic Variation

Only two species of *Heliconius* butterflies are shown here. They resemble each other where they occur together even though both species' color patterns vary by location. Both are distasteful to birds and other vertebrate predators due to poisons in the plants they feed on as caterpillars. They advertise this with bright, warning coloration.

How have the two species come to look alike? Predators that eat a distasteful butterfly learn to avoid others with the same color pattern. Individuals of both species are more likely to survive and reproduce if they have a similar color pattern, so the process of natural selection favors the resemblance.

Pupa

When a butterfly caterpillar is ready to molt to the pupa (chrysalis) stage, it makes a pad of silk threads along the substrate. Certain groups also add a silk loop around their middle.

Some butterfly pupae hang suspended, others are upright or prone.

Distribution

Lepidoptera occur on every continent except Antarctica. They are found in virtually every habitat on land-and some caterpillars even live under water. A few species are distributed worldwide, though most have a limited range.

The lives of butterflies and moths are inseparable from other living organisms, especially the plants the butterflies and moths feed on as caterpillars.

Tropical Lepidoptera

Supported by a wealth of plants and habitats, the diversity of butterfly and moth species and their complex interrelationships abound in the tropics.

Wisconsin is 56,200 square miles and has about 150 species of lepidoptera.
Costa Rica is 19,600 Square miles and has more than 1,000 species

More than 1,000 species of butterflies occur in Costa Rica compared with about 150 species in Wisconsin, and new species are still being discovered in Costa Rica and elsewhere in the tropics.

Biologists estimate more than 50% of all living species occur in the tropics—on just 7% of the Earth's land in the narrow belt between the tropics of Cancer and Capricorn. That is why it is critical to preserve even small remnants of tropical forests such as the Tirimbina Rainforest in Costa Rica.

Singing Caterpillars

Some caterpillars produce sound when bumps on the head strike grooved appendages called papillae (pah-PIL-e) as the caterpillar moves its head in and out. The vibrations produced are carried along the substrate and “call” ants to the caterpillar.

Certain caterpillars have evolved specialized relationships with ants for protection against predators. They use sounds and odors that mimic the ants’ communication system, and in some cases, the caterpillars provide a nutritious liquid to feed the ants.

Five butterflies and two moths are officially listed by Wisconsin as endangered (likely to go extinct) or threatened (likely to become endangered). The Karner Blue butterfly is on the federal endangered species list. It is illegal to collect or harm these animals. They are all associated with wetlands, prairies or barrens, habitats that have become rare since Wisconsin was settled in the early 1800s.

Egg

Eggs of each species of butterfly and moth differ in size, shape, and color. The color often changes as the caterpillar develops.

Wisconsin Endangered Lepidoptera

Proper management of remaining natural habitats is one of the greatest challenges for conserving WIsconsin’s biological diversity. Important elements such as bison grazing are gone, and new factors such as invasive non-native species further alter the ecology.

Because certain butterflies and moths are intimately linked with specific natural habitats, they can serve as important indicators of whether management techniques are working effectively.

Human destruction of natural habitats in Wisconsin has pushed many butterflies, moths, and other organisms to the brink of extinction, and threatens the survival of many more. Grasslands including prairies once covered 9% of Wisconsin ,but few remain, and 47% of Wisconsin’s original wetlands are gone.

MPM curator Susan Borkin has studied and worked on conservation of Wisconsin’s endangered Poweshiek skipper and Swamp Metalmark butterfly.

“Besides understanding what caused their declines, it is important to learn what elements are critical for their survival. This will help ensure existing populations thrive and allow new populations to be established.” -Susan Borkin

Diversity 1

Lepidoptera, being one of the largest groups of animals, are heavily affected by human activities. The impact can vary from extinction of a species to providing conditions for a species to become an environmental threat (“pest”).

Pest

Species with the greatest potential to become pests are those with many generations per year and the ability to use a wide range of food plants and habitats. Most pests were introduced from other parts of the world, but their natural controls (predators and parasites) were left behind. Humans are often involved in transporting species or creating conditions (such as plant monocultures) favorable for pest development.

In 1869, a researcher studying silk production accidentally introduced European gypsy moths into Massachusetts. Without their predators and parasites, the gypsy moths quickly multiplied. People have unknowingly aided the spread of gypsy moths by carrying egg masses on their cars, campers, or with nursery stock to new locations. Over time, heavy gypsy moth infestations can alter the plant and animal communities of a forest. Efforts to eradicate gypsy moths have been costly and largely unsuccessful. Caution is required, as use of general pesticides takes a toll on native Lepidoptera and other creatures.

Now Extinct

The Xerces blue butterfly once lived near San Francisco, California. It was last seen in 1944. Its habitat was destroyed. While new butterfly and moth species are still being discovered, at the current rate of extinction, many will perish before we even learn about them.

Endangered Lepidoptera

Species that are naturally rare—have few generations a year, require specialized food plants and habitats—are more likely to become threatened or endangered as a result of human activities.

Collecting or importation of some endangered butterflies and moths is now regulated under strict U.S. federal and international laws. Unfortunately, the laws seldom address the losses of natural habitats that now underlie most species declines.

Today, human alteration of natural habitats is the main reason numerous species are becoming extinct. Human populations have grown at an explosive rate since the mid-1900s and have developed an unprecedented ability to change environments on a massive scale—rapidly and often permanently!

The Tirimbina Rainforest Center was created in 1994 thanks to the generosity of Jack Puelicher and other donors when the Milwaukee Public Museum and Riveredge Nature Center sponsored acquisition of 750 acres of tropical rainforest in northeastern Costa Rica, Central America for preservation, research, and education.

For more than 20 years prior, MPM Curator Dr. Allen M. Young conducted research on tropical insect ecology there to uncover some of the complex interrelationships that bind species together. Today, researchers from the Milwaukee Public Museum and elsewhere are using Tirimbina for their studies. The Tirimbina Rainforest Center also welcomes students, eco-tourists, and educators from Wisconsin and the rest of the world.

In one research project, Young used the lure of banana baits and mark-recapture techniques to compare two Costa Rican populations of *Morpho peleides*, one in an "island" of dry forest and the second in a large tract of wet forest. This type of basic research is necessary to understand the interdependencies of butterflies within specific habitats and what is required for their conservation.

Several of the butterfly species you will encounter in the *Puelicher Butterfly Garden*, including the beautifully iridescent blue *Morpho peleides*, thrive at the Tirimbina Rainforest Center, Milwaukee's own tropical rainforest!

Framed Butterfly Display

Many moths and butterflies are at risk due to deforestation and other manmade changes to the natural environment. Learn more about a special specimen in MPM's collection that is at risk due to habitat loss.

Diversity Panel 2

Lepidoptera illustrate the wealth of nature's biological diversity.

This is a sample of the worldwide diversity in families and species of Lepidoptera from the research collections of the Milwaukee Public Museum. The collections provide a historical record of part of the Earth's natural history and are held as a public trust to serve local, national, and international audiences.

The Milwaukee Public Museum's Lepidoptera Collections

The MPM Lepidoptera Collections date back to the late 1800s. The oldest specimens were collected locally by members of the Wisconsin Natural History Society.

Since that time, the Museum has been fortunate to have the continuing support of some of Wisconsin's most knowledgeable lepidopterists.

As of 1999, the collections had over 256,000 specimens from around the world, with an emphasis on Wisconsin and the Neotropical region (Central and South America). The collections continue to grow through research studies by MPM curators and specimen donations that further the goals and mission of the Museum.

When James R. Neidhoefer donated his collection in 1980, it nearly doubled the size of the Museum's holdings. It significantly improved the number of species represented and made many rare and scientifically valuable specimens available to researchers for the first time.

Other outstanding collections donated to MPM include William E. Sieker's worldwide Sphingidae and a collection of West Indian butterflies from Albert Schwartz.

Center for Biodiversity Studies

Recognizing the global loss of natural habitats and biodiversity, and the significance of Lepidoptera as one of the most diverse groups of living organisms, the Milwaukee Public Museum's Center for Biodiversity Studies was created in April 2000.

The goal of the Center is to interpret and conserve the Earth's biological diversity through research and education focused on butterflies and other life forms.

As we face the very real threat of almost complete devastation of intact tropical and temperate biodiversity, we owe it to future generations to gain a better understanding of the biology of the living organisms that currently inhabit our planet.

— P. J. DeVries, 1997

Praying Mantis

Lepidoptera face many challenges in the struggle to survive: severe weather, competition, and predators. Predators range from tiny mites that can suck a butterfly egg dry, to hungry grizzly bears that eat millions of hibernating cutworm moths each winter, to people driving down the highway!

This greatly enlarged model shows a praying mantis that has captured a sulphur butterfly.

What does it take to survive?

Adaptation to the environment

Body Temperature

Lepidoptera do not maintain a constant body temperature, but can regulate it somewhat through their behavior. In order to fly, their thorax muscles must be at least 65 degrees Fahrenheit (75-86 degrees Fahrenheit is typical for active butterflies).

Many moths are active at night. To raise their body temperature, they shiver—contracting flight muscles without beating their wings. Note the fuzziness of these moths. The long, dense scales act as insulation and help retain body heat.

Butterflies raise body temperature by basking in the sun or on warm surfaces. Basking positions vary with the species. Some bask with wings wide open; others angle their wings to reflect light onto their bodies. To avoid overheating they perch with wings closed, minimizing exposure.

Migration

Some tropical Lepidoptera migrate from the dry lowlands into adjacent moist mountains. This becomes an important conservation issue because migrating animals need corridors of land to provide a continuum of habitat from ocean to mountain.

Unfavorable conditions (too hot, cold, wet, or dry) cause many Lepidoptera to enter a state of metabolic slowdown called diapause (DIE-a-paws). Other species migrate. Genetic controls and changes in day length or temperature trigger the physiological changes that precede diapause or migration.

Diapause

In parts of the tropics, the dry season is much like our temperate winters but without the cold. Many Lepidoptera go into diapause until the rainy season brings on fresh nectar and new leaves for the next generation.

What does it take to survive?

An incredible array of defenses

Defenses can be structural, chemical, or behavioral. Some, like camouflage coloration, are passive. Others, like poisonous secretions, impact the predator to allow escape.

Despite all their defenses, 90% or more of a butterfly or moth's offspring do not survive to become adults. Instead, they become an integral part of the food web fueling many other species' survival.

What does it take to survive?

A unique migration strategy

Monarch butterflies originated in the tropics and do not survive freezing temperatures. Parts of North America offer an abundant supply of milkweeds for monarch caterpillars to feed on, but winters are too cold for monarchs to survive. A unique migration cycle has evolved that allows monarchs to take advantage of the seasonal milkweed resource—and survive winter.

November to mid-March: Monarchs spend the winter at 10-14,000 feet elevation in the mountains of Mexico. Millions of monarchs mass together on the trees at the winter sites. Close-up image shows monarchs gathered at the trunk of a tree. It is one of the most spectacular occurrences in nature.

Remarkably, millions of monarchs end up in approximately the same 10 to 12 small wintering sites even though not one of the arriving butterflies has been there before. Deforestation and other conservation issues threaten the continued existence of the migration, so it has been called an "endangered phenomenon."

Mid-March through April: Monarchs journey north. Monarchs leave the winter sites in Mexico, returning to the southern states to breed. Increasing day length and warm temperatures prompt the butterflies' change in behavior.

April through May: Their offspring continue north. Monarchs arrive in Wisconsin from mid-to-late May just as the milkweeds are re-emerging. Image shows MPM Curator Susan Borkin collaborating with monarch authority Lincoln P. Brower, PhD, surveying monarch populations in

Door County, WI.

June through August: There are three or more summer generations. The life cycle takes about a month. Reproductive adults live two to six weeks. Milkweeds are the only plants monarchs lay their eggs on and the caterpillars eat.

Late August through October: Monarchs migrate south. The non-reproductive migrants feed heavily to build their body fat. They may live six to nine months. They survive the winter living off their fat reserves. Many monarchs west of the Rocky Mountains migrate to sites along California's Pacific Coast for the winter.

What is a Butterfly?

Butterflies are animals

Classification
Kingdom Animal
Phylum Arthropod
Class Insect
Order Lepidoptera

Like other animals, each kind of butterfly has specific needs for:
Food: (caterpillar and adult)
Space: suitable habitat to live in (climate and vegetation)
Mates: a mate of the opposite sex to produce offspring
Defenses: defenses against many enemies

What is a Butterfly?

Tiger moths are not butterflies, but a relative in the same Order, Lepidoptera. Tiger moths' larvae (and some adults) consume toxic plants to gain chemical protection against would-be predators. Visit our MPM collection's page below to learn more.

Tiger Moths | Milwaukee Public Museum

Butterflies are insects

Some say "insects shall inherit the Earth," but perhaps they already have. The majority of animals, more than 80%, are insects. Insects and flowering plants are the dominant forms of life on Earth today. Because insects are small, a habitat that supports only a few large animals can support great numbers and many kinds of insects.

Insects have three main body parts—head, thorax, and abdomen--external body support called an "exoskeleton," six legs (three pair), two antennae, often one or two pair of wings.

What is a Butterfly?

Butterflies and moths are Lepidoptera

In addition to scales, adult Lepidoptera have two grooved mouthparts that zip together to form a hollow feeding tube called a proboscis.

Muscles within the mouthparts allow the proboscis to be extended and moved, or coiled beneath the head. Muscles in the head provide the pumping action to draw liquids up through the proboscis.

Most lepidoptera feed by sucking up liquids such as flower nectar, juices from rotting fruits or tree sap, and perspiration. A few primitive moths with chewing mouthparts eat pollen, and some moths with greatly reduced mouthparts don't feed at all.

What is a Butterfly?

Watch Wonders of Butterfly Wings Video

Butterflies and moths are Lepidoptera (scale-winged insects)

The name Lepidoptera comes from the Greek words *lepido* (scale) and *ptera* (wing).

The beautiful patterns on butterfly wings are mosaics made of different kinds of overlapping scales. Each scale is one color. The color depends on the scale's pigment and structure.

Scales probably evolved for body insulation, but scales on the wings improve lift 15% during flight. Scales can also be pulled loose and may allow Lepidoptera to "slip" from the grasp of predators.

Is this butterfly blue or brown?

It depends on your angle!

The iridescent blue of the Morpho butterfly results when light strikes ridges on the scales at a perpendicular angle. BLue wavelengths are reflect off the ridges, while pigments in the scales absorb other wavelengths. Changing the angle, light spectrum, or ridges changes the reflectance.

Color patterns on the supper and lower surfaces of the wings can be quite different. What benefit might this provide?

Watch Monarch Puppets Video

How Does a Butterfly Grow?

The life cycle

All butterflies and moths go through four different stages as they grow. This process is called metamorphosis (met-ah-MOR-feh-sis) -- to change in form.

The cycle length varies by species, from three weeks to as long as several years.

1) After mating, a female butterfly carefully selects a suitable site to lay a fertilized egg.
2) A caterpillar (larva) develops within the egg, chewing its way out at the proper time. Each kind of caterpillar feeds only on certain plants. As it grows, the caterpillar molts—

shedding its old head capsule and cuticle (skin).

3) In its final molt, the caterpillar forms into a chrysalis (pupa). During this stage, the tissues of the caterpillar are reorganized to form the body of an adult.
4) After the adult butterfly emerges, its wings expand and harden. Soon it will seek a mate and the cycle of life will start again.

How Does a Butterfly Grow?

Gynandromorphs are butterflies that show both male and female characteristics. Learn more about MPM's extensive collection of gynandromorphs by clicking the icon below.

Gynandromorphs Collection

Genetics and environment shape development

Genetic diversity is essential among individuals of a species. It helps the species to survive changing conditions in different locations over time.

Size

Small butterflies don't become big butterflies— in fact, no body growth occurs in the adult stage. Butterflies and moths cannot replace lost scales, damaged wings, or other body parts.

Appearance

Color patterns can vary between male and female of the same species (sexual dimorphism) and between individuals produced at different times of the year (seasonal variation) or in different locations (geographic variation).

Aberrations

When development does not proceed normally, individuals with aberrations can result. A gynandromorph (gi-NAN-dro-morf) has both male and female traits.

How Does a Butterfly Grow?

Giant silk moths

Many of the largest moths are in the giant silk moth group (family Saturniidae). Saturniid caterpillars enclose themselves in a dense silk cocoon before changing to the pupa stage. Adults spend their brief time producing the next generation. Most have reduced mouthparts.

After the female giant silk moth emerges from her cocoon, she emits a pheromone (scent) from the tip of her abdomen to attract a mate.

Special antennal cells allow the male to detect the female's scent from one or more miles away. Antennae of the male silk moth are usually much wider than those of the female. Most of a giant silk moth's life is spent as a caterpillar (feeding) or pupa (hibernating).

Giant silk moth cocoons were used historically by some North American Indians and African tribes to make hand rattles, ankle rattles, purses, necklaces, and other artifacts.

Cocoons of the giant silk moths are not used for making silk fabrics because the individual silk strands are too short.

An Asian moth, *Bombyx mori* (family Bombycidae), is the species used for the commercial production of silk.

These giant silk moths are the largest moths native to Wisconsin. Most fly at night in early summer. They are sometimes attracted to lights. The caterpillars feed on many kinds of trees and shrubs. They spend winter as pupae protected within their cocoons. All stages of these moths are favorite food items for birds, squirrels, and other animals.

How does a butterfly grow?

Life histories vary with the species

Life History: Compare life histories for three Wisconsin Butterflies

	Baltimore	Cabbage White	Painted Lady
Origin	native	introduced circa 1860	migrant
Habitat	wetland	disturbed	open fields
Generations per year	one	three or more	one to four
Eggs laid	in clusters of 50-250	singly or loose groups	singly
Caterpillar food plants	specialist on turtlehead, others after diapause	mustard family	generalist using more than 100 species from various families
Winter survival	as partially grown caterpillar	in pupa stage	does not survive in Wisconsin

Life Span

Average adult life span for butterflies and moths varies by species, sex, time of year, and other factors. Males often emerge ahead of females, but females usually live longer.

Life is short for the spring azure. Males may live two days, females as long as four.

In summer, reproductive monarchs live a few weeks, but fall migrants may live up to nine months.

Passion vine butterflies

Some passion vine butterflies can live for many months and reproduce continuously because they have the special ability to feed on amino acids from pollen.

The amino acids enhance the butterfly's ability to produce eggs. The butterflies hold pollen on their proboscis. produce a fluid that helps release the amino acids, and then drink the nutritious fluid.

Passion vine butterflies also have the ability to remember where they've fed. They "trap-line," visiting the same plants in sequence each day to feed at newly opened flowers. This is important because the nectar and pollen plants they use are usually widely scattered within the rainforest.

Create a Butterfly Garden

To provide food and shelter

Long before European settlers brought honeybees to the New World, our native bees, butterflies, and moths were pollinating plants while getting nectar. Adult butterflies use nectar as their food energy. Wind-pollinated flowers do not produce nectar. Butterflies favor fragrant purple, yellow, orange, and red blossoms, but color is less important than nectar production. Flat-topped blossoms or clusters of short tubular flowers provide the easiest access for butterflies to land and feed.

What happens to butterflies and moths in winter?

Most Wisconsin Lepidoptera go into a metabolic slow down called diapause (DIE-a-paws) overwinter. Diapause includes internal changes such as production of antifreeze chemicals within the body.

Angelwing butterflies found in woodlands go into diapause as adults. They take shelter under loose bark, in wood piles, and similar protected spots.

Although butterflies seldom use them, hibernation houses are designed to be winter shelters for these butterflies. Butterfly hibernation houses should be placed in wooded, shady areas - not open, sunny gardens.

Many southern butterflies like the buckeye and red admiral migrate into Wisconsin when conditions are favorable but do not survive the winter.

The sphinx moth goes through winter as a pupa below ground.

The Isabella moth spends winter as a partially grown caterpillar (wooly bear). It resumes feeding and pupates in the spring.

The giant silk moth spends winter as a pupa within its silk cocoon.

The swallowtail butterfly overwinters as a chrysalis (pupa) above ground.

Create a Butterfly Garden

To provide food for caterpillars and energy-rich nectar for adults

Select a sunny location, sheltered from wind.

You'll discover how dynamic the natural world is. Your garden and its visitors will change by the day, season, and from year to year. Butterfly gardens won't replace natural areas, but when you restore habitat for butterflies and moths, you create a rich environment for many forms of life.

Group nectar plants and design your garden to bloom throughout the season.

Trees, shrubs, herbs, and grasses can all be used. Many of our native plants and some exotics like butterfly bush (Buddleia) are favored. A field guide and butterfly gardening books are helpful for identifying butterflies and choosing plants for your garden.

Include plants that butterflies lay eggs on and caterpillars eat. *Do not use pesticides.*

Enjoy your garden and share it with others. A garden diary, butterfly checklist, and close-up photography can be fun ways to record the highlights.

Garden Diorama

Butterflies can be easy to spot, but there's so much more to discover in your own neighborhood. Ask an adult to go on a walk with our Fresh Air Bingo card to see what you can discover outside!

Fresh Air Bingo PDF