

## Photo Description



Two butterfly cocoons hang from a building corner. One cocoon is brown and looks empty. The other cocoon is bright green with small yellow spots and a black line at the top.

## Scientific Phenomena

This image shows the Anchoring Phenomenon of metamorphosis in monarch butterflies. The green structure is a chrysalis (not a cocoon) where a caterpillar has transformed its body completely into a butterfly. Inside the chrysalis, special cells called imaginal discs rebuild the caterpillar's body parts into wings, antennae, and other butterfly features. The brown structure appears to be an empty chrysalis after a butterfly has emerged. This complete change from caterpillar to butterfly is called complete metamorphosis and takes about 10-14 days.

## Core Science Concepts

1. Complete Metamorphosis: Butterflies go through four distinct life stages - egg, larva (caterpillar), pupa (chrysalis), and adult butterfly. Each stage looks completely different from the others.
2. Life Cycles: All living things have predictable patterns of growth, development, and reproduction that repeat over time.
3. Adaptation and Survival: The hard chrysalis protects the developing butterfly from predators and weather while the transformation happens inside.
4. Observable Changes: Scientists can observe and document the external changes that happen during metamorphosis, even though the internal changes are invisible.

### Pedagogical Tip:

Have students create a simple T-chart comparing "What I can see" vs "What I cannot see" when observing chrysalises. This builds observation skills and introduces the concept that important scientific processes often happen where we cannot directly observe them.

### UDL Suggestions:

Provide multiple ways for students to represent the butterfly life cycle: drawing, acting it out with body movements, using play dough to sculpt each stage, or creating a digital presentation. This supports different learning preferences and abilities.

## Zoom In / Zoom Out

**Zoom In:** Inside the chrysalis, the caterpillar's body breaks down into a nutrient-rich soup. Special groups of cells called imaginal discs, which were dormant in the caterpillar, now activate and use this soup to build completely new body parts like wings, reproductive organs, and compound eyes.

**Zoom Out:** Monarch butterflies are part of a larger ecosystem where they serve as pollinators for flowers and food sources for birds and spiders. Their famous migration connects ecosystems across North America, from Canada to Mexico, making them important for maintaining biodiversity across the continent.

### Discussion Questions

1. What do you notice that is the same and different about these two chrysalises? (Bloom's: Analyze | DOK: 2)
2. Why do you think the chrysalis is hard on the outside? (Bloom's: Evaluate | DOK: 3)
3. What questions would you ask a scientist who studies butterflies? (Bloom's: Create | DOK: 3)
4. How might the location where this chrysalis is hanging help or hurt the butterfly inside? (Bloom's: Evaluate | DOK: 3)

### Potential Student Misconceptions

1. Misconception: "The butterfly is sleeping inside the cocoon."  
Reality: The caterpillar's body is actively being broken down and rebuilt into a completely different form.
2. Misconception: "Butterflies make cocoons."  
Reality: Butterflies make chrysalises, while moths make cocoons. A chrysalis is a hard shell, while a cocoon is made of silk threads.
3. Misconception: "The caterpillar just grows wings inside."  
Reality: The caterpillar's entire body structure changes - it grows new organs, loses old ones, and completely reorganizes its body plan.

### Cross-Curricular Ideas

1. Math - Counting & Graphing: Have students collect data by observing chrysalises over time. Create a simple bar graph showing "How many days until the butterfly emerges?" Students can practice counting, comparing numbers, and creating visual representations of data.
2. ELA - Sequencing & Writing: Students write or dictate the four stages of butterfly metamorphosis in order using sentence frames like "First, the egg hatches. Next, the caterpillar eats. Then, the chrysalis forms. Finally, the butterfly emerges." This builds sequencing skills and narrative writing.
3. Art - Color & Texture: Students create chrysalises using mixed media (tissue paper, paint, collage materials) to explore the different colors and textures they observe in real chrysalises. This connects observation skills to artistic expression and helps students notice fine details.
4. Social Studies - Living in Communities: Discuss how butterflies are part of a community of living things in a garden or neighborhood. Students can create a simple poster showing which plants butterflies need and which animals depend on butterflies for food, introducing ecosystem concepts.

### STEM Career Connection

1. Entomologist (Insect Scientist): An entomologist is a scientist who studies insects like butterflies, caterpillars, and moths. They observe how insects live, grow, and change. They might raise butterflies in a lab, watch them through a microscope, or help protect butterflies in nature. Average Annual Salary: \$65,000 USD
2. Butterfly Conservationist: A butterfly conservationist works to protect butterflies and the plants they need to survive. They might plant special gardens, count wild butterflies, or teach people why butterflies are important. They help make sure butterflies have safe places to live. Average Annual Salary: \$50,000 USD
3. Nature Photographer: A nature photographer takes pictures of animals and plants in their natural habitats, like the photo shown here! They use cameras and special lenses to capture insects during different life stages. Their photos help scientists study animals and teach people about nature. Average Annual Salary: \$45,000 USD

### NGSS Connections

Performance Expectation: 2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.

Disciplinary Core Ideas:

- 2-LS4.D: There are many different kinds of living things in any area, and they exist in different places on land and in water.
- K-LS1.A: All animals need food in order to live and grow.

Crosscutting Concepts:

- Patterns: Patterns in the natural world can be observed and used as evidence.

### Science Vocabulary

- \* Chrysalis: The hard shell where a caterpillar changes into a butterfly.
- \* Metamorphosis: The process of an animal changing from one form to a completely different form.
- \* Life cycle: The stages a living thing goes through as it grows and develops.
- \* Larva: The caterpillar stage of a butterfly's life.
- \* Pupa: The chrysalis stage when the caterpillar transforms into a butterfly.

### External Resources

Children's Books:

- From Caterpillar to Butterfly by Deborah Heiligman
- The Very Hungry Caterpillar by Eric Carle
- Waiting for Wings by Lois Ehlert