

## Photo Description



## Scientific Phenomena

This image captures the anchoring phenomenon of pollination and plant-animal interactions. The bee is likely searching for nectar or pollen from plants to feed itself and its colony. As the bee moves between flowers, pollen grains stick to its fuzzy body hairs and get transferred from one flower to another, allowing plants to reproduce. This mutualistic relationship benefits both organisms - bees get food while plants get help with reproduction.

## Core Science Concepts

1. Mutualistic Relationships: Bees and flowering plants depend on each other for survival - bees get nectar and pollen for food, while plants get pollination services for reproduction.
2. Animal Adaptations: Bees have specialized body features like branched hairs, pollen baskets on their legs, and long tongues that help them collect pollen and nectar efficiently.
3. Plant Reproduction: Many plants rely on animal pollinators to transfer pollen between flowers, which leads to seed formation and the continuation of plant species.
4. Ecosystem Interdependence: Pollinators like bees are essential for maintaining healthy ecosystems and food webs, as they help plants reproduce that provide food and shelter for other organisms.

### Pedagogical Tip:

Use the "Think-Pair-Share" strategy when introducing pollination. Have students first think individually about what they notice about the bee's body, then pair with a partner to discuss, and finally share observations with the class. This builds confidence and ensures all students can participate.

### UDL Suggestions:

Provide multiple ways for students to demonstrate understanding of pollination - some can draw and label diagrams, others can act out the process, and some can create digital presentations. This supports different learning preferences and abilities.

### Zoom In / Zoom Out

1. Zoom In: At the microscopic level, pollen grains have unique shapes and structures with spiky or smooth surfaces that help them stick to bee hairs. Inside flowers, male pollen must reach the female parts to create seeds through fertilization.
2. Zoom Out: This single bee is part of a larger pollination network that supports entire ecosystems. Without pollinators, many plants would disappear, affecting food chains and causing ecosystem collapse. About one-third of human food crops depend on animal pollination.

### Discussion Questions

1. What body features help this bee collect pollen, and how might these features be different from other insects? (Bloom's: Analyze | DOK: 3)
2. How would our ecosystem change if all the bees disappeared tomorrow? (Bloom's: Evaluate | DOK: 4)
3. What evidence from the photo shows that this bee is well-adapted for visiting flowers? (Bloom's: Apply | DOK: 2)
4. Why do you think flowers are often colorful and smell sweet? (Bloom's: Understand | DOK: 2)

### Potential Student Misconceptions

1. Misconception: Bees intentionally pollinate flowers to help plants.  
Clarification: Bees collect pollen and nectar for food - pollination happens accidentally as they move between flowers.
2. Misconception: Only bees can pollinate plants.  
Clarification: Many animals pollinate plants including butterflies, birds, bats, and even some mammals, plus wind and water can also spread pollen.
3. Misconception: All bees make honey and live in hives.  
Clarification: Most bee species are solitary and don't make honey - only honeybees and some bumblebees produce honey for their colonies.

### Cross-Curricular Ideas

1. Math - Data Collection and Graphing: Students can conduct a bee observation study by counting how many times a bee visits different colored flowers during a set time period. They can then create bar graphs or pie charts to display which flower colors attract the most bees, and calculate percentages to show pollination patterns.
2. ELA - Informative Writing: Have students research and write an informative paragraph or short report about a specific pollinator (bees, butterflies, hummingbirds, bats) and its role in pollination. They can use facts from reliable sources and include a labeled diagram with their writing to explain how that pollinator helps plants reproduce.
3. Art - Bee and Flower Design: Students can create a mixed-media artwork showing the relationship between bees and flowers. They might design their own imaginary flowers with specific colors and patterns to attract pollinators, or create a detailed illustration of a bee showing its adaptations with labels and decorative elements.
4. Social Studies - Local Agriculture: Investigate how farmers in your community depend on pollinators for crops like apples, almonds, or blueberries. Students can learn about local beekeepers, visit a farmer's market to identify pollinator-dependent foods, or research how climate change affects pollinator populations in your region.

## STEM Career Connection

1. Beekeeper/Apiarist: A beekeeper raises and cares for honeybee colonies in specially designed hives. They manage the bees' health, harvest honey and beeswax, and help protect bee populations. Beekeepers work outdoors and must learn about bee behavior and plant cycles. Average Salary: \$48,000 - \$65,000 annually
2. Pollination Biologist: These scientists study how pollinators like bees, butterflies, and birds help plants reproduce. They work in laboratories and outdoors to understand pollination patterns, protect endangered pollinator species, and help farmers maintain healthy ecosystems. Average Salary: \$55,000 - \$75,000 annually
3. Agricultural Scientist: Agricultural scientists research ways to grow healthy crops while protecting pollinators and the environment. They might test new farming methods, develop bee-friendly pesticides, or design gardens that attract beneficial insects. They work on farms, in research labs, and universities. Average Salary: \$62,000 - \$82,000 annually

## NGSS Connections

- Performance Expectation: 5-LS2-1 - Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment
- Disciplinary Core Ideas: 5-LS2.A - 5-LS1.C
- Crosscutting Concepts: Systems and System Models - Cause and Effect
- Science Practices: Developing and Using Models, Engaging in Argument from Evidence

## Science Vocabulary

- \* Pollination: The process of moving pollen from one flower to another so plants can make seeds.
- \* Mutualism: A relationship where two different organisms help each other survive.
- \* Adaptation: Special body parts or behaviors that help an organism survive in its environment.
- \* Nectar: A sweet liquid that flowers make to attract pollinators like bees.
- \* Compound eyes: Eyes made of many small parts that help bees see colors and movement very well.
- \* Colony: A group of bees that live and work together in the same nest or hive.

## External Resources

Children's Books:

- The Magic School Bus: Inside a Beehive by Joanna Cole
- National Geographic Readers: Bees by Laura Marsh
- The Bee Book by Charlotte Milner