

Photo Description



This image shows a gray tree frog (or similar tree frog species) clinging to a white surface, displaying its characteristic bumpy skin and adhesive toe pads. A smaller frog is visible to the right. You can see the frog's special sticky toe pads with their textured ridges that help it climb smooth surfaces, and its textured skin that helps it blend into tree bark and blend with its surroundings.

Scientific Phenomena

Anchoring Phenomenon: Why can frogs stick to smooth surfaces like walls and ceilings?

This phenomenon occurs because frogs have evolved specialized toe pads covered with tiny ridges and mucus-secreting cells. These adaptations create suction-like grip through a combination of:

- Micro-textured pads that increase surface contact
- Sticky mucus secreted from specialized glands that acts like natural glue
- Structural toe design that allows pads to conform to uneven surfaces

This is an example of structural adaptation—a physical feature that helps an organism survive in its environment. Tree frogs use this adaptation to hunt insects on vertical surfaces and escape predators in their forest habitats.

Core Science Concepts

- * **Structural Adaptations:** Physical features (like toe pads, bumpy skin) that help organisms survive and thrive in their specific environments. The frog's sticky toe pads are a structural adaptation for climbing trees.
- * **Camouflage & Coloration:** The frog's gray, bumpy skin color and texture helps it blend in with tree bark, making it harder for predators to spot. This is a protective adaptation.
- * **Amphibian Life Cycle & Characteristics:** Amphibians are vertebrates that live part of their lives in water (eggs and tadpole stage) and part on land (adult stage). They have moist skin and need to stay near water to reproduce.
- * **Function Follows Form:** An organism's body structure (form) is directly connected to what it can do (function). The frog's body shape, leg design, and toe pads are all shaped by its need to climb and hunt in trees.

Pedagogical Tip:

When teaching about frog adaptations, use a "Detective" approach: Have students examine close-up photos or real specimens (if available) and ask them to infer what each body part does **BEFORE** telling them. This builds observational skills and deeper understanding. For example: "Why do you think this frog's toes look bumpy and different from a human's?" This activates prior thinking and increases engagement.

UDL Suggestions:

Representation: Provide multiple ways for students to learn about frog adaptations:

- Visual: Close-up macro photography of toe pads
- Kinesthetic: Have students attempt to climb a smooth wall vs. a textured wall with/without sticky tape on their fingers to simulate toe pads
- Auditory: Listen to frog calls to understand communication

Action & Expression: Allow students to demonstrate understanding through different formats:

- Draw and label frog adaptations
- Create a physical model of toe pads using materials like clay
- Write from the frog's perspective ("My toe pads help me because...")

Discussion Questions

1. "If a tree frog lost its sticky toe pads, how would its life change?" (Bloom's: Analyze | DOK: 3)
2. "Why do you think tree frogs are gray or brown instead of bright red like some other frogs?" (Bloom's: Infer | DOK: 2)
3. "How is a tree frog's adaptation different from a swimming frog's adaptations, and why might each need different body features?" (Bloom's: Compare/Contrast | DOK: 3)
4. "Can you think of another animal that has a sticky or gripping adaptation? How is it similar to the frog's toe pads?" (Bloom's: Apply | DOK: 2)

Extension Activities**1. Build a Frog Toe Pad Model**

Students create a model of a tree frog's toe pad using materials like craft foam, sandpaper, clay, or tape. Have them test different textures on a smooth surface (like plastic wrap) to see which materials grip best. This connects structure to function through hands-on exploration.

2. Frog Adaptation Investigation Station

Set up stations where students examine real or high-quality photos of different frog species (tree frog, bullfrogs, poison dart frogs). For each, students complete a chart: What adaptations does this frog have? Where does it live? How do its adaptations help it survive there? This builds comparison skills and deepens understanding of adaptation diversity.

3. Sticky Tape Climbing Challenge

Give students small pieces of painter's tape or removable adhesive tape. Have them stick the tape to their fingertips and attempt to climb a smooth wall (indoors, low height, supervised). Then repeat without tape. Discussion: How is the tape like a frog's toe pads? What happened when the "adhesive" wore off? This kinesthetic experience helps students internalize how friction and stickiness enable climbing.

NGSS Connections

Performance Expectation: 5-LS1.A: Structure and Function

Students who demonstrate understanding can explain how the body structure of different animals helps them perform different functions.

Disciplinary Core Ideas:

- 5-LS1.A Structure and Function
- 5-LS2.A Interdependent Relationships in Ecosystems (frogs as predators/prey)

- 3-LS3.B Variation of Traits (different frog species have different adaptations)

Crosscutting Concepts:

- Structure and Function The frog's toe pad structure enables its climbing function
- Cause and Effect Sticky toe pads CAUSE the frog to successfully climb trees

Science Vocabulary

- * Adaptation: A body part or behavior that helps an animal survive in its home environment (the frog's sticky toes are an adaptation for climbing).
- * Amphibian: An animal that spends part of its life in water and part on land, with moist skin and no scales (frogs, toads, salamanders).
- * Camouflage: Colors or patterns on an animal's body that help it blend in with its surroundings and hide from predators (the frog's gray skin matches tree bark).
- * Predator: An animal that hunts and eats other animals (a frog is a predator of insects).
- * Toe Pad (or Adhesive Pad): The special sticky, textured part on the bottom of a tree frog's feet that helps it cling to smooth surfaces.
- * Mucus: A slippery, sticky liquid produced by frogs' skin that helps them stay moist and grip surfaces.

External Resources

Children's Books:

- Leap Frog by Jane Clarke (realistic fiction about frog adaptations)
- National Geographic Little Kids First Big Book of Animals by Catherine D. Hughes (non-fiction with detailed frog photos)
- From Tadpole to Frog by Gail Gibbons (life cycle and adaptations explained clearly)

YouTube Videos:

- "Tree Frog Climbing in Slow Motion" by BBC Earth (1:30 min). Shows exactly how toe pads work with slow-motion footage of climbing. URL: <https://www.youtube.com/watch?v=Uu8gT7xJHBg> (or search "BBC tree frog toe pads")
- "How Do Tree Frogs Stick to Leaves?" by TED-Ed (4:15 min). Animated explanation of the science behind adhesive toe pads, perfect for fifth graders. URL: <https://www.youtube.com/watch?v=WpA7rZCaHyE> (or search "TED-Ed tree frog adhesion")

Teacher Tips:

- Consider inviting a local naturalist or zoo educator to discuss frog adaptations in person
- If possible, arrange a visit to a nature center with a frog habitat
- Use this lesson as an entry point to discuss ecosystems, food chains, and habitat loss