

## Photo Description



This image shows the glass walls of a tall building reflecting another building nearby. The glass windows act like mirrors, showing the shape and windows of the other building. You can see how light bounces off the smooth glass surface to create this mirror-like effect.

## Scientific Phenomena

The Anchoring Phenomenon is reflection of light from smooth surfaces. When light rays hit the smooth glass windows of this building, they bounce back at the same angle they came in, following the law of reflection. This creates a mirror-like image of the nearby building. The glass acts as a reflective surface because it is very smooth and flat, allowing light to bounce off in an organized way rather than scattering in all directions like it would from a rough surface.

## Core Science Concepts

1. Light Reflection: Light travels in straight lines and bounces off smooth surfaces at predictable angles, creating mirror images.
2. Surface Properties: Smooth, flat surfaces like glass create clear reflections, while rough surfaces scatter light in many directions.
3. Light Behavior: Light can be absorbed, transmitted through materials, or reflected back depending on the material's properties.
4. Mirror Images: Reflections appear reversed from left to right compared to the original object.

### Pedagogical Tip:

Have students use small mirrors and flashlights to explore how the angle of incoming light equals the angle of reflected light. This hands-on experience helps them understand the predictable nature of reflection.

### UDL Suggestions:

Provide multiple ways for students to explore reflection: tactile experiences with actual mirrors, visual demonstrations with laser pointers (teacher use only), and kinesthetic activities where students "act out" light rays bouncing off surfaces.

## Zoom In / Zoom Out

1. Zoom In: At the molecular level, smooth glass surfaces have tightly packed molecules that create an even surface. When light photons hit these organized molecules, they bounce back in a uniform pattern, preserving the image.

2. Zoom Out: This reflection phenomenon is part of larger urban heat island effects. Glass buildings reflect sunlight and heat throughout cities, affecting local temperature patterns and energy use in surrounding buildings.

### Discussion Questions

1. What would happen to the reflection if the glass windows were scratched or dirty? (Bloom's: Predict | DOK: 2)
2. How is this building reflection similar to and different from your reflection in a bathroom mirror? (Bloom's: Compare | DOK: 2)
3. Why can you see the reflection better on sunny days than on cloudy days? (Bloom's: Analyze | DOK: 3)
4. If you were designing a building, how might you use reflection to help or prevent certain effects? (Bloom's: Create | DOK: 4)

### Potential Student Misconceptions

1. Misconception: "The building is actually inside the glass."

Clarification: The building image is a reflection - light bouncing off the glass surface brings the image to our eyes, but the building itself remains in its original location.

2. Misconception: "Only mirrors can create reflections."

Clarification: Any smooth, shiny surface can create reflections including water, polished metal, and glass windows.

3. Misconception: "Light gets trapped in the glass."

Clarification: Light bounces off the glass surface and travels to our eyes - it doesn't stay in the glass.

### Cross-Curricular Ideas

1. Math - Angles and Geometry: Students can measure and draw angles using mirrors and protractors to understand how the angle of incoming light equals the angle of reflected light. They can create diagrams showing light rays hitting a surface at different angles, reinforcing the concept of angle measurement.

2. ELA - Descriptive Writing: Have students write detailed descriptions of what they see in reflections, using sensory words and comparisons. They could write "reflection poetry" where they describe how an object looks different when reflected, exploring the concept of perspective and point of view.

3. Art - Perspective and Composition: Students can create artwork inspired by reflections in glass, exploring how reflections change the appearance of buildings and objects. They can experiment with drawing reflected images and comparing them to the original, discovering how reflections flip left to right.

4. Social Studies - Urban Design: Discuss how architects and city planners use glass buildings and their reflective properties when designing cities. Students can explore how modern glass buildings reflect light differently than older brick buildings, connecting to how cities change over time and how people design buildings to meet community needs.

### STEM Career Connection

1. Optical Engineer: Optical engineers design and build systems that use light, including mirrors, lenses, and glass for telescopes, cameras, and eyeglasses. They figure out how to bend and bounce light to help people see things better. These professionals work on everything from smartphone cameras to scientific instruments. Average Annual Salary: \$105,000

2. Architect: Architects design buildings and plan how they look and work. They think about how light will reflect off materials like glass and metal, and how this affects how beautiful and energy-efficient the building is. They work with engineers to choose the right materials for windows and walls. Average Annual Salary: \$84,000

3. Materials Scientist: Materials scientists study different substances like glass, metals, and plastics to understand their properties, including how they reflect light. They test materials to see which ones work best for building windows, mirrors, and other products that use reflection. Average Annual Salary: \$98,000

### NGSS Connections

- Performance Expectation: 4-PS4-2 - Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen
- Disciplinary Core Ideas: 4-PS4.B - An object can be seen when light reflected from its surface enters the eyes
- Crosscutting Concepts: Cause and Effect - Students identify the cause (smooth glass surface) and effect (clear reflection)
- Science and Engineering Practices: [[NGSS:SEP:Developing and Using Models]] - Students can model how light reflects off surfaces

### Science Vocabulary

- \* Reflection: When light bounces off a surface and travels back toward where it came from
- \* Surface: The outside or top layer of something that light can hit
- \* Angle: The direction that light travels when it hits and bounces off something
- \* Absorb: When a material takes in light instead of bouncing it back
- \* Transmit: When light passes through a clear material like glass or water

### External Resources

Children's Books:

- Bouncing and Bending Light by David Dreier
- Light by David Dreier
- Mirrors and Reflections by Karen Bryant-Mole