

## Photo Description



A person is reaching toward a large, colorful soap bubble that shows rainbow colors. The bubble is floating in the air above a playground. You can see the thin, clear bubble wall with pretty colors like purple, blue, and yellow shining on it.

## Scientific Phenomena

This image demonstrates the Anchoring Phenomenon of light interference in thin films. When white light hits the soap bubble's thin wall, different wavelengths of light reflect off the front and back surfaces of the bubble film. These light waves interact with each other, causing some colors to appear brighter (constructive interference) while others cancel out (destructive interference). This creates the rainbow pattern we observe. The bubble's spherical shape and varying thickness across its surface produce the swirling, dynamic color patterns that captivate young observers.

## Core Science Concepts

1. Light and Color: White light contains all colors of the rainbow, which become visible when separated through reflection and interference in the soap film.
2. Properties of Materials: Soap bubbles are made of a thin layer of soapy water that has different properties than regular water, allowing it to stretch into a sphere.
3. Forces and Motion: Surface tension pulls the soap film into the smallest possible shape (a sphere) while air pressure inside keeps the bubble inflated.
4. Patterns in Nature: The rainbow colors appear in predictable patterns based on the thickness of the soap film and the angle of observation.

### Pedagogical Tip:

Use bubble-making activities to engage multiple senses and allow students to make predictions about what will happen before testing their ideas. This builds scientific thinking skills while maintaining high engagement.

### UDL Suggestions:

Provide multiple ways for students to explore bubbles: visual observation, gentle touching (before popping), drawing their observations, and verbal descriptions. Consider students with sensory sensitivities by offering alternatives like bubble solution in containers for closer examination.

### Zoom In / Zoom Out

1. Zoom In: At the molecular level, soap molecules have a "head" that likes water and a "tail" that doesn't. These molecules arrange themselves in a thin layer with water trapped between, creating the bubble wall that's only a few hundred molecules thick.
2. Zoom Out: Bubbles connect to larger weather and atmospheric systems - humidity affects how long bubbles last, wind patterns influence their movement, and the same light principles that create bubble colors also create rainbows in the sky after rainstorms.

### Discussion Questions

1. What do you notice about the colors on the bubble, and how are they similar to other things you've seen? (Bloom's: Analyze | DOK: 2)
2. Why do you think the bubble is round instead of square or triangle-shaped? (Bloom's: Apply | DOK: 2)
3. What might happen to the colors if we looked at the bubble from a different side? (Bloom's: Predict/Synthesize | DOK: 3)
4. How could we test which bubble solution recipe makes the strongest bubbles? (Bloom's: Create | DOK: 3)

### Potential Student Misconceptions

1. Misconception: "The colors are painted on the bubble or come from colored soap."  
Scientific Clarification: The colors come from clear white light being separated by the bubble, similar to how a prism works.
2. Misconception: "Bigger bubbles are stronger than smaller bubbles."  
Scientific Clarification: Larger bubbles are actually more fragile because the soap film gets thinner as it stretches over a bigger area.
3. Misconception: "All bubbles are perfectly round."  
Scientific Clarification: While soap bubbles try to form spheres due to surface tension, they can be distorted by air currents, contact with objects, or when multiple bubbles connect.

### NGSS Connections

- Performance Expectation: 2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- Disciplinary Core Ideas: 2-PS1.A - Different materials can be identified by their properties
- Crosscutting Concepts: Patterns - Patterns in the natural world can be observed and used as evidence

### Science Vocabulary

- \* Reflection: When light bounces off a surface, like how you see yourself in a mirror.
- \* Surface tension: The force that pulls the outside of liquids together, making bubbles round.
- \* Transparent: Something you can see through clearly, like the bubble wall.
- \* Sphere: A perfectly round ball shape, like bubbles try to make.
- \* Properties: The special things about materials that help us identify them.

## External Resources

Children's Books:

- Pop! A Book About Bubbles by Kimberly Brubaker Bradley
- Bubble Bubble by Mercer Mayer
- The Magic School Bus: Light and Color by Joanna Cole

YouTube Videos:

- "How Do Soap Bubbles Get Their Colors?" by SciShow Kids - Simple explanation of bubble colors with engaging visuals (<https://www.youtube.com/watch?v=8DIAQSdNce4>)
- "Bubble Science for Kids" by Peekaboo Kidz - Explores bubble properties and simple experiments (<https://www.youtube.com/watch?v=QbHqAjnmjgU>)