

## Photo Description



A large cargo ship with a red bottom and black top floats on water. The ship has tall poles called cranes that help load and unload heavy things. You can see the word "DOCKSHIP" written on the side of this big boat.

## Scientific Phenomena

The Anchoring Phenomenon is buoyancy - how massive, heavy objects like cargo ships can float on water. This happens because the ship displaces (pushes away) a volume of water that weighs more than the ship itself. The upward force from the water (buoyant force) balances the downward force of the ship's weight, allowing it to stay afloat rather than sink to the bottom.

## Core Science Concepts

1. Buoyancy and Floating: Objects float when they displace water that weighs more than the object itself
2. Forces in Balance: The upward push of water equals the downward pull of gravity on the floating ship
3. Density Differences: Ships are designed with hollow spaces filled with air, making their overall density less than water
4. Mass vs. Weight: Even though the ship has tremendous mass, it can still float due to its shape and design

### Pedagogical Tip:

Use a clear container with water and various objects (clay ball vs. clay boat shape) to demonstrate how shape affects floating. This concrete experience helps students understand the abstract concept of buoyancy.

### UDL Suggestions:

Provide multiple ways for students to explore floating: hands-on experiments, digital simulations, and drawing/labeling activities to accommodate different learning preferences and physical abilities.

## Zoom In / Zoom Out

**Zoom In:** At the molecular level, water molecules are constantly pushing against the ship's hull. These tiny pushes add up to create the buoyant force that keeps the massive ship floating.

**Zoom Out:** This cargo ship is part of a global transportation system that moves goods across oceans. The same physics principles that keep this ship afloat also work for all floating objects in Earth's water cycle, from icebergs to leaves on a pond.

### Discussion Questions

1. What do you think would happen if we filled the ship completely with water instead of cargo? (Bloom's: Predict | DOK: 2)
2. How is this big ship similar to a small toy boat floating in your bathtub? (Bloom's: Compare | DOK: 2)
3. Why might the ship's designers make the bottom part red and the top part black? (Bloom's: Analyze | DOK: 3)
4. What forces are working on this ship right now to keep it floating? (Bloom's: Identify | DOK: 1)

### Potential Student Misconceptions

1. Misconception: "Heavy things always sink in water."  
Reality: Weight alone doesn't determine if something floats - it's about how much water the object pushes away compared to its weight.
2. Misconception: "Ships float because they're made of special materials."  
Reality: Ships float because of their shape and design, not the materials. Even steel ships can float if designed properly.
3. Misconception: "Bigger objects sink faster than smaller ones."  
Reality: Size doesn't determine floating - a huge ship can float while a small rock sinks.

### Cross-Curricular Ideas

1. Mathematics - Measurement & Comparison: Have students measure the lengths of different toy boats and predict which ones will float. Create a class chart showing boat length vs. floating ability. Students can use rulers and record data in simple tables, connecting measurement skills to the buoyancy concept.
2. English Language Arts - Descriptive Writing: Ask students to write or dictate sentences describing what they see in the ship photo using adjectives (big, red, heavy, tall). They could also create simple stories about cargo ships traveling to different ports, practicing narrative writing while reinforcing vocabulary.
3. Social Studies - Global Trade & Shipping Routes: Discuss how cargo ships like this one carry toys, clothes, and food from one country to another. Show students a world map and trace simple shipping routes. This helps them understand how ships connect communities and cultures around the world.
4. Art - Design & Color: Have students design their own cargo ship using markers or paint, deciding what colors to use and why. They could draw the ship from different angles (side view, top view) or create a diorama of a port with multiple floating vessels, exploring perspective and spatial relationships.

### STEM Career Connection

1. Ship Captain/Maritime Officer: A ship captain is the leader who steers large cargo ships across the ocean, making sure the ship stays on course and the cargo arrives safely. They use maps, technology, and understanding of water and weather to guide the vessel. Ship captains need to understand how ships float and move through water. Average Annual Salary: \$80,000 - \$120,000
2. Naval Engineer/Marine Engineer: These scientists and engineers design and build ships, including how to make them float safely while carrying heavy cargo. They use math and physics (like buoyancy!) to create strong hulls and decide where to place cargo so the ship stays balanced in the water. Average Annual Salary: \$85,000 - \$130,000

3. Port Operations Manager: A port manager oversees the loading and unloading of cargo ships at docks, making sure everything runs smoothly and safely. They plan schedules, manage workers, and use technology to track cargo. They need to understand how ships work and how to safely move heavy loads on and off vessels. Average Annual Salary: \$65,000 - \$105,000

### NGSS Connections

- Performance Expectation: 2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose
- Disciplinary Core Ideas: 2-PS1.A - Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature
- Crosscutting Concepts: Cause and Effect - Events have causes that generate observable patterns

### Science Vocabulary

- \* Buoyancy: The upward push that water gives to objects, helping them float
- \* Displace: To push something out of the way and take its place
- \* Density: How tightly packed the matter in an object is
- \* Hull: The main body of a ship that touches the water
- \* Cargo: The goods or materials that ships carry from place to place

### External Resources

Children's Books:

- Who Sank the Boat? by Pamela Allen
- Boats by Byron Barton
- Harbor by Donald Crews