Curiosity Guide #305
Buoyancy

Accompanies Curious Crew, Season 3, Episode 5 (#305)

Aluminum Boats

Investigation #4

Description

Which boat floats?

Materials per person

- Two 12-inch squares of aluminum foil
- 20 paper clips

Materials that can be shared in a small group

- Scissors
- Container of water
- Measuring tape or ruler

Procedure

1) Measure and cut two pieces of 12-inch aluminum foil.
2) Shape one of the squares into a flat bottom boat or square pan. Be careful not to pierce the bottom or folded-up corners.
3) Place ten paper clips in the metal boat or pan.
4) Wrap the other set of 10 paper clips in the second piece of aluminum foil. Squeeze the foil into a tight ball.
5) Place each "boat" inside the container of water.
6) What do you notice?

My Results

Explanation

Even though each boat has a similar mass, the one squeezed into a ball takes up less space than the one shaped like a pan. When an object is immersed in a fluid, it displaces or pushes aside some of that fluid. The amount of water that the aluminum boats push aside equals a force pushing upward on the boats. The aluminum ball pushes less water out of the way than the pan boat does, so the upward force is also less than the force pushing up on the wide pan, and the ball sinks.

Think about it: Don't you find it strange that a small rock will sink in water while a gigantic ship can float? This amazing fact is because of the difference in the densities of the rock and the ship. Even though the ship is much, much heavier than the rock, the ship's shape or volume spreads out all that mass and pushes down on a lot of water all at once. The water pushes back, but the weight of the water that is pushed aside creates an equal upward force called the buoyancy force. In the case of the rock, there is not enough upward buoyancy force, so the rock sinks.

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