



## Curiosity Guide #209

### Friction

Accompanies Curious Crew, Season 2, Episode 9 (#209)

#### Sticky Rice

Investigation #1

#### Description

Can you lift up a bottle without touching it? You can, if you have a pair of chopsticks and some rice!

#### Materials

- Two empty, 20-ounce, clear bottles
- Dry rice
- Chopsticks
- Funnel

#### Procedure

- 1) Take off the caps to each bottle. Set the caps aside.
- 2) Make sure that the bottles are dry inside.
- 3) Place a funnel in the neck of one bottle.
- 4) Fill the bottle  $\frac{3}{4}$  full with dry rice. Set this bottle aside.
- 5) Place the funnel in the second bottle.
- 6) Fill the second bottle  $\frac{1}{4}$  full with dry rice.
- 7) Tap the second bottle on the table to pack the rice more tightly together.
- 8) Continue to fill this bottle  $\frac{1}{2}$  full and tap the bottle again.
- 9) Repeat until the second bottle is  $\frac{3}{4}$  full.
- 10) Slide a pair of chopsticks into the loosely packed rice in the first bottle. Do the chopsticks slide right out again?
- 11) Slide the sticks into the densely-packed rice in the second bottle.

- 12) Leave the chopsticks standing up in the bottle and try to pick up the jar with the chopsticks.
- 13) What happened? Did the second bottle stick to the chopsticks?
- 14) If not, tap the base of the bottle on the table several more times to pack it down. Waiting a little while helps the rice settle too.

## My Results

## Explanation

In the first bottle, the rice is loosely packed, so there are many air pockets. When the sticks are inserted, the grains shift around but do not apply much **resistance** on the chopsticks. Tapping the second bottle on the table makes the rice grains settle more tightly together. This increases the **static friction** on each of the grains of rice. When the chopsticks go into the second bottle, there is less space to move the grains of rice, and there is higher **frictional force**. The higher frictional force makes it possible to lift the entire bottle off the table.

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