

# Soap up!

You can scrub as long as you like with plain water, but you'll never get yourself really clean. Here's why: Each tiny molecule (particle) of water has a weak electrical charge that makes it attractive to other water molecules. The molecules stick together and can't mix with oil and grease.



To get rid of the dirt, you have to use soap with the water. Soap acts as an emulsifier, allowing water and greasy dirt to mix (see opposite page). It makes the dirt slippery so it loosens its grip on your skin and gets washed away.

## Soapless soap

Long ago, the Phoenicians discovered that boiling goat fat, water and ash until the liquids evaporated made a hard, waxy soap. Soap makers have followed a similar recipe ever since.

Soap is wonderful stuff, but it has its drawbacks. It leaves a scum, for one thing. During World War I, the Germans couldn't get fat into the country to make soap. They needed something to wash with, so they invented detergent, a "soapless soap" made from chemicals. To everyone's surprise, detergent worked better than soap. It didn't leave scum, and it wasn't affected by the minerals in hard water. Today's detergents often contain extra ingredients such as bleach and enzymes that boost their cleaning power.





# Mix oil and water

**How do soap and detergents work? Try this experiment to find out.**

## You'll need

- 2 small jars with tight lids
- water
- red food coloring
- cooking oil
- liquid soap or detergent

**1** Fill one jar with water. Add two drops of red food coloring and stir. Pour half of the now pink water into the second jar.

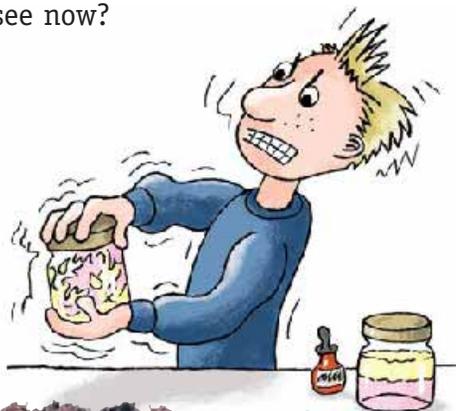
**2** Fill up each jar with cooking oil. Notice how the liquids separate into two layers, with the oil on top.



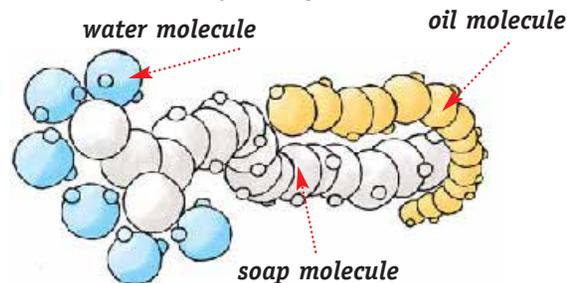
**3** Add a squirt of soap or detergent to one jar only. Screw both lids on tight.



**4** Shake each jar for about five seconds and set it down again. What do you see now?



When you shake the jars, the liquids are thrown together like bumper cars at a fun fair. In the jar without soap, the oil and water eventually separate again into their yellow and pink layers. But in the other jar, the soap doesn't let that happen. Instead, the whole thing becomes a sudsy orange mixture.



Oil and water molecules slide off each other, but soap molecules stick to them both. When the molecules mix, one end of a soap molecule grabs water molecules, and the other end grabs oil. That makes it hard for the two liquids to separate. The same thing happens when you have a shower or wash clothes. The soap molecules hold onto the dirt particles until they are rinsed together down the drain.