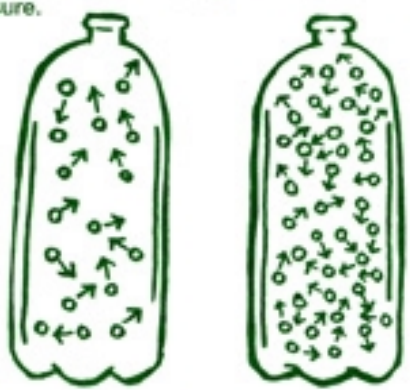
UNDER PRESSURE

You saw in Experiment #1 that gases push against objects. Gases push all the time. But they don't always push with the same force. The amount of push, or pressure, a gas exerts depends on two things: its density and its temperature.

To understand how density affects pressure, imagine a bottle full of air. All the molecules are floating around freely, bumping into each other and into the sides of the bottle. The bumping creates a certain amount of pressure.

Now imagine you force more air into the bottle. This increases its density. There are many more molecules bumping around now, and all that extra bumping creates extra pressure.



EXPERIMENT #7 EXPLODING BAG

Ask a parent for permission before you do this experiment. And do it outdoors. It's messy! But it's worth it.

Fill a sandwich-size plastic zipper bag about half full with warm water. Then drop in three Alka-Seltzer tablets. Seal the bag as quickly as you can. Set it on the ground and move back.

Keep your eyes on the bag. It will start to swell and bulge. It gets fatter and fatter until suddenly...KA-BOOM!

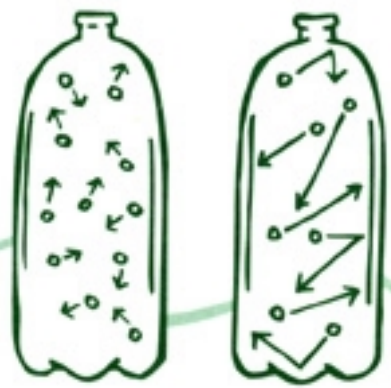
What happened? Alka-Seltzer tablets give off carbon dioxide gas when placed in water. The gas can't escape from the closed bag, so the pressure increases. More and more gas builds up. Before long, the pressure is so great that the bag can't take it anymore. It explodes, and the carbon dioxide escapes harmlessly into the air.

Heating a gas is another way to increase its pressure. When a gas gets hotter, its molecules speed up. The extra speed makes the molecules do a lot more bumping around. And once again, more bumping means more pressure.

Here's the problem. Gases don't like to be at different pressures. A higher-pressure gas will always move toward a lower-pressure gas if its path is not blocked.

Gas sometimes sneaks out of your body when you're not eating or drinking. That's because pressure is building up inside you. When the pressure gets great enough, the gas will push its way into the lower-pressure air outside your body.

It seems like this always happens at the most embarrassing, public time. But there's no scientific reason for this. It's just life.



EXPERIMENT #8 CRUSHED BOTTLE

Fill a 2-liter soda bottle with hot water from the tap. Let the bottle sit for about five minutes—long enough to get nice and warm.

Now pour all the water into the sink. Immediately screw the cap onto the bottle.

You don't have to wait long for results. The bottle starts to make popping noises, and its sides get pushed inward!

When you heat the bottle, you also heat the air inside. Its pressure goes up, and some of it escapes. (Remember the Bubbling Egg experiment on page 5?) The warm air in the bottle is now less dense than the cool air outside the bottle. The pressure is the same, though, because of the temperature difference.

But then you put the cap on the bottle, blocking the air's passage. As the air inside the bottle cools, its pressure decreases. The air outside wins the pushing war and smashes the bottle!