Food is always mixtures of solids, gases, and liquids. (Actually, food is almost always mixtures of mixtures, and figuring out how to separate them has its own challenges, as we'll see later in this chapter.) We talked about *humidity*—dissolved water vapor in air—in the previous chapter, but what do we call dissolved air in water? It's what fish breathe, but we don't even have a word for it!

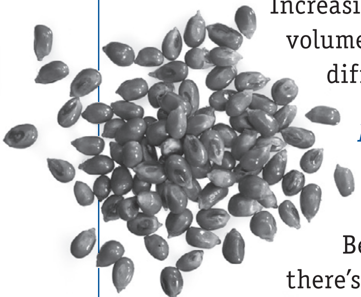
Gases dissolve into liquids all the time—think carbonated drinks, or the small bubbles you see when heating water to boil—and changes in pressure change how much gas can be dissolved. This is known as *Henry's Law*: essentially, the higher the pressure of a gas above a liquid, the more soluble that gas becomes. (Huh. There's no Potter's Law yet. Probably too late; all these laws seem to have been named about two centuries ago. The English chemist William Henry came up with this one in 1803.) You can dissolve gases into foods to make foams like whipped cream (and Aero chocolate!), and you can use a pressurized container to make wild things like carbonated fruit.

In the following sections, we'll take a look at how to cook with pressure cookers and cream whippers, covering what they are and how to use them.

Dropping the temperature of a liquid *increases* the amount of gas that will dissolve into it. If you're trying to saturate gas into a liquid, cool the liquid down first.

Why does popcorn pop?

Because of pressure! Popcorn kernels have the magic combination of a tough, airtight hull and a moist interior (~13% water) that explodes when heated. Most grains have this combination: amaranth, quinoa, and sorghum also pop.



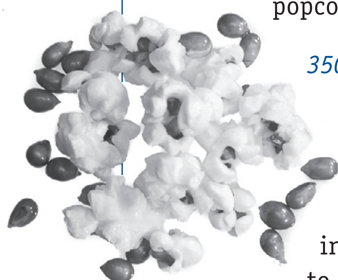
Increasing temperature in a fixed volume also increases pressure, with different results.

Below 300°F / 150°C

As kernels heat up, water inside them also heats up. Because the water can't boil—there's very little space for the water to expand into water vapor—the pressure inside the kernel increases.

310–340°F / 155–170°C

Some weak kernels rupture, but there's not enough pressure built up to explode the kernel's starches out very far, making small, not-really-delicious popcorn pieces.



350°F / 177°C and up

At 135 psi—nine times atmospheric pressure!—the kernel's hull ruptures. With the drop in pressure, the water inside instantly boils and converts to steam, expanding ~1,500-fold and dragging the outer layer of starches along for the ride.