Instant Freeze

Watch a bottle of liquid water instantly freeze before your eyes.

WHAT TO DO

Carefully remove a sealed bottle of water from the ice-water-salt bath in the cooler (make sure it's not frozen already). Gently smack the bottle with your other hand or tap it on the table. Ice crystals should begin to form and grow until the pure water inside is completely frozen. If nothing happens at first, hit it harder.

WHAT'S HAPPENING?

The water in the bottle has been super-cooled, i.e. its temperature is lower than the melting temperature (or you might say the "normal" freezing temperature) yet remains in the liquid state. While this seems contradictory, it's actually not, and is surprisingly easy to accomplish. While pure water ice will always begin to melt once the temperature reaches 32°F or 0°C, liquid water does not necessarily begin to freeze as it cools to the same temperature. Water in the solid state is a crystal, and crystallization requires a nucleation site or a "seed" crystal to begin. This could be an air bubble, a scratch on the bottle, or even two molecules bumping each other the right way. The lower the temperature the easier it becomes to initiate crystallization, but if you are careful and cool liquid water slowly without disturbing it, you can easily super-cool it to 24°F or lower while keeping it liquid, until something disturbs it forming that first tiny crystal, at which point, because it is so cold, the rest of the liquid freezes almost instantly.