## **Why does ice float?**

Everyone knows things get bigger when they get hotter and shrink when they cool. Thermometers tell the temperature that way because the (liquid) alcohol inside them expands as it heats up and contracts when it cools down. But water is different. Almost uniquely, water expands as it starts to freeze! This amazing trick is called the **anomalous expansion of water**—and here's how it works.

If you start off with a glass of water and cool it down, the molecules start to move closer and lock together. But at a temperature of about 4°C (39°F), the molecules are as close as they can possibly get. In other words, the water has reached its maximum density. If you keep on cooling it down, the molecules rearrange themselves into a slightly more open structure. This means ice is a little bit less dense than cold water and that's why ice floats on water.

So now we understand why ice floats on top of water, but how does this work on a lake? Imagine that it is the beginning of winter, and the temperature has just gotten below freezing. Air changes temperature faster than water -- this is why a swimming pool seems much warmer in the evening. The air cools down at night, but the pool water remains almost as hot as it was during the day. So although the air is freezing cold, the water isn't freezing yet. The water at the very top of the lake is in direct contact with the cold air, so it freezes first. And because ice is less dense than water, the sheet of ice doesn't sink. If the temperature stays very cold, the sheet of ice gets thicker, but the ice also acts as a barrier, or insulator, between the cold air and the warmer water underneath. The sheet of ice helps the rest of the water from becoming ice!

Ice floating on top of water in a lake or pond is very important for fish and other aquatic organisms. Even during very cold winters, the organisms in the lake can survive in the liquid water underneath the solid frozen ice. Also, since the ice acts as an insulator the water under the ice is more likely to stay water throughout the entire winter. As you can imagine, if a lake froze all the way through, there would be no place for the fish and other organisms to go and they would not survive.

So the next time you enjoy an ice cold glass of water, think about how unique it is that solid ice floats on liquid water. And remember how this special property of water allows fish and other aquatic organisms to survive in cold climates.

**Sources:**

<http://www.explainthatstuff.com/water.html>

<http://scienceline.ucsb.edu/getkey.php?key=418>