Physics in a Glass: Ice and Oil

What you Need
• An ice cube tray
• Food coloring
• A clear glass
• Vegetable oil

What to Do
1. Add a drop of food coloring to one of the molds in an ice cube tray.
2. Add water to the ice cube tray.
3. Place ice cube tray in the freezer until frozen.
4. Fill a clear glass halfway full with oil.
5. Remove the colored ice cube from the ice cube tray.
6. Put the colored ice cube in the glass of oil and watch it melt.
7. What happened?

Some say water and oil don't mix, but what about ice and oil?
What's Going On?
Both oil and ice can be slippery, but this is where the similarity ends. Oil and ice have very little in common. Actually, oil doesn't like ice, or more specifically melted ice, water. Oil is known as hydrophobic, meaning that it repels water. When you put the ice cube in the oil it begins to melt. It doesn't mix with the oil because oil is hydrophobic. This explains why the oil and water don't blend together, but this doesn't explain why the water goes to the bottom of the cup and why the ice floats at the top of the cup.

Fill the glass almost full of cooking oil. I found that cheap, vegetable oil worked very well. Canola oil did not work at all, as it was not dense enough. Place the glass of oil on a flat surface and then gently add an ice cube. The ice should float. If it does not, try using a different kind of oil.

Now comes the interesting part. Oil floats on top of water and ice floats on top of oil. What will happen when the ice begins to melt? Watch a minute or two and you will see. As the ice begins to melt, you will see a drop of water hanging from the bottom of the ice cube. As the drop grows, the ice cube will float lower, as it is being weighted down by the denser water. Finally, the drop gets large enough to pull free of the ice and it slowly sinks to the bottom of the glass.

This is all comes back to density, or how much stuff is in an object. If something is denser than something else, it will sink. Water is denser than oil; that's why water sinks to the bottom of the glass. Ice, however, is a funny solid. When water freezes and turns to ice, it actually takes up more space than it did when it was water, but it has the same amount of stuff in it. This means it is less dense than water. That's why ice cubes float in your water glass. Since ice is less dense than water, the water settles to the bottom. Since the ice is less dense than water and therefore less dense than oil, it floats at the top.