Destiny in Density

Well, it finally had to happen. So far, we've talked about floating without mentioning the d-word, density. We've explained floating in terms of a balance between buoyant force and weight. There is, however, another way of presenting buoyancy. It has to do with a concept called density. Density refers to the concentration of matter. In simplest terms, it can be thought of as how much "stuff" is packed in a given volume. Substances with a greater density sink when placed in fluids with lesser density. Likewise, substances with a lesser density float when placed in fluids with greater density.

Materials
- Penny
- A cup
- Cooking oil
- Food coloring
- A tall drinking glass
- Corn syrup
- Water
- Balsa wood
- A lid to a plastic film canister
- A piece of hard candy (made with sugar)

To Do
Carefully pour several ounces of corn syrup into a tall drinking glass so that the corn syrup forms a layer several fingers thick. Pour about 8 ounces of water into a small, clean cup. Next, add several drops of food coloring to the water (it makes the layers look more dramatic). Tilting the glass, carefully pour this colored water into the drinking glass so that the water flows down the inner side of the container (and doesn't splatter). Save a small amount of the colored water for later. After the water has been added, introduce the cooking oil in the same manner. Stop when the oil forms a layer that is several fingers thick.

Observe how the layers interact. Do they mix? Do they stay perfectly separated? Now add a piece of balsa wood, the lid to a plastic film canister, a piece of hard sugar candy, and a penny to the mixture. At which level do these materials float?
The mixture that you formed had three layers. Each layer remained mostly separate because each has its own density. The corn syrup has the greatest density and so it remained at the bottom. The colored water has a medium density and remained in the middle. The oil has the lowest density and remained afloat.

Balsa wood has a density less than oil. Therefore, the wood floated on top of the oil. The plastic from a film canister is less dense than water but more dense than oil. Hard candy is denser than water but less dense than corn syrup. The penny is the densest one of them all and sank to the bottom of the container.

By now, you may be saying to yourself, "Hey, wait a second. This experiment is rigged! Floating depended upon the order in which liquids were poured."

The pouring order helped keep the layers distinct and separate. Their position in the mixture, however, was determined solely by the density of the substance.

Check It Out! Which is denser, hot air or cool air?