PURPOSE:

   To create a working model of
   ATTENUATION, COMPRESSION, and DENSITY

MATERIALS:

   1 clear plastic bottle
   1 eye dropper or syringe
   1 bucket - to collect spills
      water

Procedure:

1. Fill bottle to the top with water.
2. Fill eyedropper or syringe about 2/3 full of water.
3. Drop eyedropper or syringe into bottle.
4. Close bottle tightly.
5. If the dropper or syringe sinks to the bottom, take it out, remove some water and repeat steps 3 and 4.
6. Manipulate the bottle by squeezing it. The more you squeeze the bottle, the farther "Dan" will sink..
      Practice squeezing in a way that makes it appears as if you're just holding the bottle.
7. Command "Dan" to sink, surface, and subsurface.
      Ask the students if they can figure out how to get "Dan" to obey them.
8. Explain what's really happening.
9. Have students create their own Diver Dan as homework.

What's Really Happening

It has to do with the bubble inside Diver Dan.   Dan's mass consists of the water and air in the eyedropper or syringe. When the bubble inside Dan is bigger, the air in it is attenuated, or stretched out; therefore there is less mass inside Dan than there is outside him. He is less dense, so he floats. When we get Dan's density to be exactly that of the water that surrounds him, he will subsurface, or hang around the middle of the bottle. When we squeeze the bottle, the water in it has nowhere to go except inside Dan, where the bubble is. As it pushes into Dan it compresses the air that was inside into a smaller space and replaces it. Because the water is denser than the air which previously took up the space, Dan's density increases, making him heavier, so he sinks. When we stop squeezing the bottle, the water flows out of Dan back into the bottle, the bubble gets bigger, the air in the bubble attenuates again which decreases Dan's density, and he floats again.

   There are only two ways to make something sink - decrease the volume or increase the mass.
   There are only two ways to make something float - increase the volume or decrease the mass.