



High Touch High Tech®

Science Experiences That Come To You

Bubble Atmosphere

Ingredients & Supplies:

- 9 oz. plastic cup
- Straw
- Flashlight
- Bottle of liquid soap
- Extra newspaper

Instructions:

First, fill your cup half-way with water. Next, stick your straw into the water. Now look at your straw right at the water level. Does your straw look bent? Why? Remember, light travels in straight lines! But, light hits the cup from many different directions and is *refracted*. This means that the light changes direction and bounces back from many different angles. You no longer see a straight line of light. This refraction of light also happens in the bathtub or swimming pool. Have you noticed that your feet look about twice as big when you are in the water? This is because water bends the light. Light, of course, travels only in straight lines; however, water bends this light and creates optical illusions such as the straw or your foot in the pool.

Now you are going to build your very own atmosphere. An atmosphere is layer upon layer of very important chemical shields.

Put 3-5 drops of liquid soap into your cup of water. Now you can use your straw to make bubbles! Make sure your straw stays inside the water and begin to blow bubbles through your straw and into the water. (Be careful not to suck in, or you will taste the soap!)

Now turn on your flashlight and turn off the lights in the room. Shine your flashlight into your bubbles and see what happens. Look at the amazing atmosphere in your cup!

Take a look around and observe your light sources. What color is the light coming out of the lights on the ceiling? White. Now what color is the light coming through the windows? You might think that the sunlight is yellow – but it's not! Do you see yellow color on the floor where the light is coming in? No. You actually see white. Observe the light in the room and the colors of the light. Light on the ceiling is white. Light through the window is white. The light from your flashlight is also white!



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Now take your straw and pull it out of the water but leave it inside the bubbles. Now blow gently and you will be blowing a bubble inside of a bubble. This is what Earth's atmosphere looks like. Notice the way you can see ROY G. BIV on every bubble – both big and small.

The Science Behind It: What is light?

Brightness, electricity, light bulbs, fire and energy are all different definitions of light. Light comes from the Sun, which is 94 million miles from the Earth! That is a very long distance! Luckily, light travels at an incredible speed. Light travels at 186,000 miles per second.

Light is emitted from the Sun and travels in a straight line towards Earth. But, when the light hits the Earth's atmosphere, it is broken up and scatters. We call this the ***electromagnetic spectrum***. The light, or radiation, from the Sun scatters into a range of wavelengths and frequencies. In fact, visible light is only a small part of the electromagnetic spectrum. The rest of the electromagnetic spectrum is made up of light that we cannot see – such as the microwaves or x-rays.

Visible light only makes up a small sliver of the electromagnetic spectrum. We can divide the visible light into a colorful range known as ROY G BIV. (Red, Orange, Yellow, Green, Blue, Indigo, and Violet.) These are the colors of a rainbow!

Real World Relevance: Glaciers and Ice Bubbles

Glaciers are large, slow moving masses of ice near the Earth's poles. Scientists study glaciers to learn about the geological processes of the Earth. These landforms provide clues to where the glaciers have been and what is occurring in Earth's atmosphere.

Snow is porous with lots of little air pockets. When snow falls to the ground, it traps all of the elements in the atmosphere. These small particles are trapped and buried beneath the snow. Any type of pollen, dirt, ash or gas is layered inside glaciers. Air bubbles are trapped in the porous snow. As the snow turns to ice, it becomes impacted and less porous. Overtime, the pores are closed off and solid glacier ice is formed. Each tiny pore has a fraction of the atmosphere trapped inside an air bubble!



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The trapped air is under an enormous amount of pressure. When the pressurized air escapes, it makes a popping sound. In fact, if you were to place a piece of glacier ice inside a glass, it might explode!

Glaciers continue to act as a geological map for scientists to study the ever-changing geological forces of Earth and its surrounding atmosphere.



Bubbles of ancient air rise from Greenland Ice Sheet as it melts, 14 July, 2008.
The black substance is cryoconite. © James Balog.