All About BAROMETRIC PRESSURE

Whether we're inside or outside, there is atmospheric pressure--- we can't see it, but it's there! And air pressure and differences in pressure are among the most important weather makers. The centers of storms are areas of relatively low air pressure, compared to pressures around the storm. High air pressure generally brings good weather.

A red "L" on the weather map indicates low pressure, while high pressure is marked with a blue "H." Keeping track of how the pressure is changing is important for forecasting the weather and you can start outside your own front door!

Try These Outside Your Front Door
Here are Barometric Pressure Projects for you to try:

-Wind Spiral
-Water Barometer
-Basic Barometer
-Pressure Gauge
-Lazy Man's Barometer

Wind Spiral
Here's what you will need for the Wind Spiral:
Recycled Computer or Typing paper
Recycled string, scissors
Hot lamp or lamp without a shade

Here's how to do it:
1. Draw a spiral and Cut it out
2. Punch a hole through the center of the spiral.
3. Thread a piece of string through the hole in the center.
4. Tie the piece of string onto one end.
5. Use the string to hang the wind spiral over a hot lamp.

Here's how to observe a change in air pressure with this wind spiral:
The heat from the sun warms the air, and the heated air moves up. This rising air causes the spiral to move up indicating a pressure increase.
Be sure to use recycled items--- you're learning about the environment--- protect and preserve it as you learn!

Water Barometer

Here's what you'll need to build a water barometer:
Clear, straight-neck recycled glass bottle (about 12 oz.)
Clear recycled glass jar (about 18 oz.)
Food coloring
Rubber band

Here's how to build the water barometer:
1. Find a bottle with a straight neck and a jar that's tall enough for the bottle to sit in it upside down, without the neck touching the jars bottom. One combination that works beautifully is a white vinegar bottle and an 18-oz. peanut butter jar. Remove all labels, clean the bottle and jar, and invert the bottle into the jar.

2. Fill the jar with enough water to come up just over the mouth of the bottle by an inch or so. Next add a few drops of food coloring. Tip the bottle and jar enough to let a few air bubbles escape from the bottle.

3. Slide the rubber band onto the jar and position it at the same level as the water. Set the barometer in a spot out of direct sunlight, where it can be observed by the kids but won't get knocked over. As the water rises(low pressure) and falls(high pressure) in the neck of the bottle, use the rubber band to mark the new level.

4. Wait for weather change and record what you observe.
Demonstrate immediate pressure change this way:
Take a large pot from your cupboard and fill it halfway with water. Press down on the surface of the water with your hands, to see how the level of the water rises and then falls when you let up. The air around your hand pushes against everything and presses down on the water in the jar, forcing the water up the mouth of the bottle. High pressure means air is pressed down toward the earth, where it warms up and stays clear, while low pressure lets air rise and cool, making the clouds that lead to rain.

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The History of the Barometer

Evangelista Torricelli invented the mercury barometer in 1643 and today's mercury barometers are much like those of the 17th century. Torricelli studied the writings of Galileo who had been working on air pressure. Though Galileo is recognized as the first to experiment with a water type vacuum device in early 1642, his primary objective was to simply ratify the "vacuum theory", and he did not examine his findings to find out that changes in the weather also caused air pressure fluctuations. Galileo had an untimely death in 1642, but his young friend Torricelli carried on with the work and constructed the first barometer. At first water was used to illustrate the principle of a vacuum to measure the weight of the air.

Torricelli was first to notice that air pressure changes, related to weather changes, indeed caused the water level to rise and fall within a 35 foot tube experiment he set up within his home. Because water is relatively light in weight, Torricelli's first barometer needed to be almost 35 feet high and literally protruded out of the roof of his home! He placed a dummy on top of this giant water column, in which the public outside could plainly see this dummy moving up and down with the changes in the weather or air pressure changes. This obviously caused great concern in his neighborhood.

Due to rumors circulating within Torricelli's gossipy Italian neighborhood, which included that he must be up to some form of sorcery or witchcraft, Torricelli realized he had to keep his experiment more secretive, or run the risk of being arrested. He needed to use a liquid that was heavier than water, and from his previous association and suggestions by Galileo, he deducted by using mercury, a shorter tube could be used. With the use of mercury, then called "quicksilver", which is about 14 times heavier than water, a tube only 32 inches was now needed, not 35 feet. Torricelli could now hide his experiment within his home, without fear from further accusations.

During this period in history, church and science were often in conflict, and scientists, especially Torricelli, were afraid of disciplinary action by the religious clerics of his day. Particularly, the concepts explaining the barometer principle were in direct conflict with current religious views, as the notion of a vacuum, or "empty space", was considered heresy in this time. "God was everywhere, there could be no vacuum", attested the cleric's of this day. It was no accident that Torricelli was ultimately buried without much fanfare, in an unmarked grave. It would be over a hundred years before he would begin to receive recognition for his scientific achievements.

Here are some more numbers about pressure:
Air exerts pressure on Earth's surface. In fact, it exerts pressure in all directions-down, up and sideways-at the same time! At sea level, air weighs 14.7 pounds per square inch. That means that a desktop area 2 inches by 2 inches has almost 59 pounds of air sitting over it. Standard copy paper (8.5 x 11 inches) has close to 1,375 pounds of air holding it down AND up at the same time.

The instruments that measure air pressure are called barometers, from Greek words for weight and measure.

Pressure Extremes

Highest Air Pressure
32.01 inches of mercury, Agata Siberia; December 31, 1968
Lowest Air Pressure
25.63 inches of mercury, West Pacific Ocean; October 12, 1979
Chicago's Highest Air Pressure
30.98 inches of mercury, February 16, 1989
Chicago's Lowest Air Pressure
28.70 inches of mercury, March 12, 1923

Test Your Knowledge Of Barometric Pressure

A. If you swan to the bottom of Lake Michigan you would feel _____ than if you were standing on top of the Sears Tower.
B. Denver, Colorado has _____ air than Chicago.
C. To measure air pressure you use a _____.
D. A read "L" on the weather map stands for a _____.

Answers
A. More
B. Thinner
C. Barometer
D. Low Pressure System

Note: All of these experiments, encouraging recycling while learning about weather, are being presented by Amy Freeze.