

Fluid Demo #6: Measure the Pressure II - The "Dry" Barometer

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OBJECTIVE	Make your own aneroid barometer.
OVERVIEW	Using simple items the student will make a device for indicating air pressure changes, called an aneroid barometer.
TOTAL TIME	Construction time 5 minutes. Observation time 10 days.
SUPPLIES	Straw Small coffee can Plastic wrap Scissors Index card Rubber band
PRINTED/AV MATERIAL	None
TEACHER PREPARATION	None

Background

Barometers using mercury are heavy and fragile. The idea of "dry" barometer was conceived by Gottfried Wilhelm Leibniz around 1700. The idea was to detect pressure changes using sealed bellows. The first working version of an aneroid (without water) barometer was built in 1843 by French scientist Lucien Vidie.

This made the barometer very portable and it became commonly use meteorological instrument. It was still calibrated to the mercurial barometer with readings in inches of mercury. Even as late at the 1990s, National Weather Service offices still calibrated and verified the accuracy of the aneroid barometer with the mercurial barometer.

Procedure

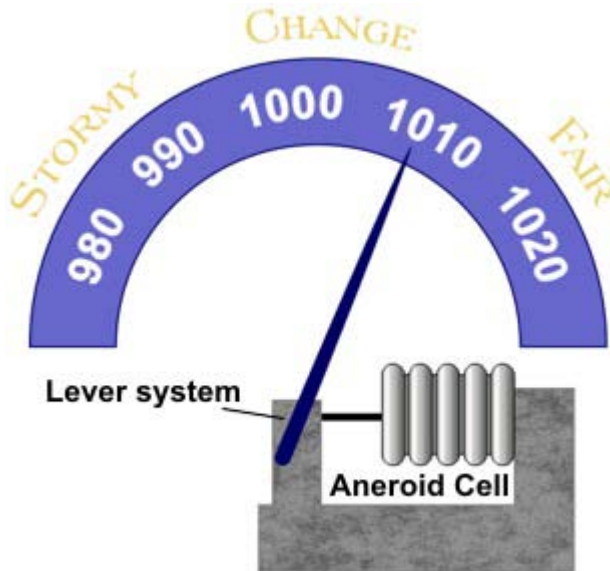
1. Cover the top of the coffee can tightly with the plastic wrap, using the rubber band to hold it in place. (The cover should be a taut, airtight fit.)
2. Position the straw so that it lays across two thirds of the cover with the remaining length of the straw suspended over air. Tape in place.
3. At a 90° angle, fold one short end of the index card at about one inch from that end. Tape the folded end of the index card to the can behind the straw in such a way that allows you to make marks on the card every day.

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4. Record the level of the straw onto the card.
5. For the next 10 days, at the same time each day, record the level of the straw while paying close attention to how changes in the weather affect the straw's level.

Discussion



What the students have constructed is similar to an aneroid barometer. It is the most common type of barometer for home use. The aneroid cell volume is very sensitive to changes in atmospheric pressure as it expands and contracts as air pressure decreases or increases. Attached to the aneroid cell is a lever indicating the air pressure. In this case, the aneroid cell is the coffee can.

In this barometer, high pressure in the atmosphere will weigh more the pressure inside the can at the time the barometer was constructed. That added weight will force the plastic wrap into the can, causing the straw tip to rise, indicating higher pressure.

The opposite will occur when low pressure is in the area. The decrease in weight of air on top of the can will help cause the plastic wrap to rise, therefore lowering the straw tip.

Today, even with sensitive electronic sensors having replaced the metal aneroid cells in most barometers, those electronic sensors still need to be calibrated to ensure their accuracy. For that calibration, we still use mercurial barometers.

NOAA – National Weather Service