

Readings

- James B. Conant, “The Development of the Concept of Atmospheric Pressure”
 - o To let water run out of barrel, need hole at top
 - o Aristotle: The earth is full. Something else must move to make way for water. “Nature “abhors” a vacuum.
 - o Today, we say pressure pushes up against water, holds it in place.

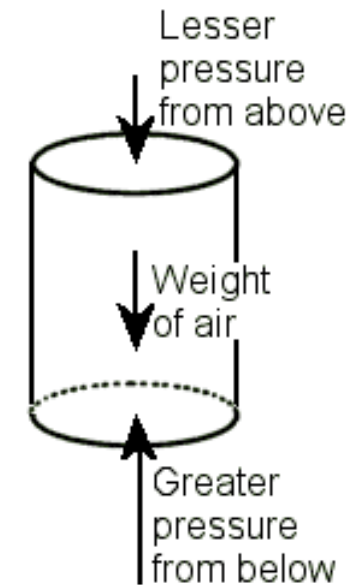


Pressure

- Force per unit area (e.g. pounds per square inch)
- Same in all directions
- Acts perpendicularly to a surface
- Effect can be from a difference in pressure
- (Heated air / steam (a) expand and/or (b) increase pressure on container, cooling does the opposite: contract and/or lower pressure)
- Later, apply to Temperamental Can

Readings (cont'd)

- o 1638: Galileo, from workmen, vacuum pump will not raise water more than 34 feet (made a poor hypothesis – breaking wire).
- o 1644: Torricelli (Galileo's student) in hypothesized “sea of air:” like ocean although made of air. Atmospheric pressure holds water in, but only so much (34 feet)
- o Mercury $13.5 \times$ denser, 30 inches



Column of air does not move, so up and down forces must be equal.

AirColumn.gif

Readings (cont'd)

- o 1647: Blaise Pascal reasoned that pressure less at high altitude, similar to increasing ocean pressure with depth.
- o 1648: Pascal's brother-in-law carried inverted mercury tube to mountain Puy-de-Dôme, saw it was less, then halfway when halfway down the mountain, constant at top.
 - "...one cannot say ... nature abhors a vacuum more at the foot of the mountain than at its summit."
- o 1654: Otto von Guericke, Magdeburg spheres

Readings (cont'd)

- 1657: Robert Boyle put mercury column inside a vacuum pump, mercury fell when air pumped out, later used for experiments inside vacuum
- Some points about this sequence of events:
 - A discovery (inverted mercury tube) becomes an instrument for further discoveries (barometer, altimeter, vacuum apparatus). “Science is cumulative or progressive.”
 - Uncertain nature of early scientific communication (private letter for Pascal, book for Boyle)