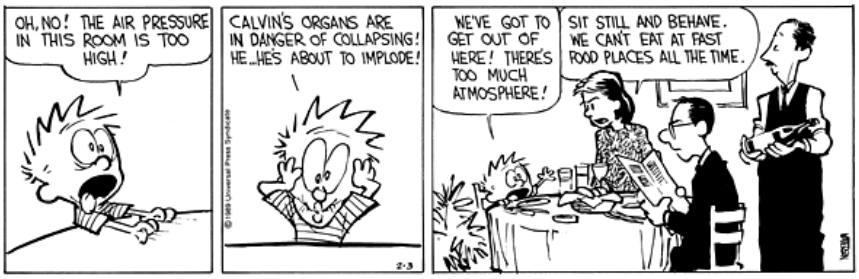
October 31, 2012 Physics 131 Prof. E. F. Redish

- **Theme Music: ZZ Top**

  Got Me Under Pressure

- **Cartoon: Bill Watterson**

  Calvin & Hobbes



Kinds of Matter

- Classify objects by how they deform.
  - *Solid*: don't change shape if you leave them alone or push on them (not too hard!)
  - *Gel*: look solid if you don't touch them but are "squishy" and change shape easily (jello, butter, clay,…)
  - *Liquid*: Have no shape of their own. Flow to fill a container but have constant volume.
  - *Gas*: Have neither shape nor volume but fill any container.
  - LOTS MORE!

Foothold ideas: Pressure

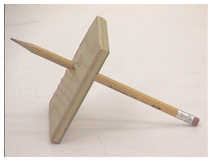
- A constrained fluid has an internal pressure –like an internal force at every point in all directions. (Pressure has no direction.)
- At a boundary or wall, the pressure creates a force perpendicular to the wall. $\vec{F} = p\vec{A}$
- The pressure in a fluid increases with depth. (Why?)

$$p = p_0 + \rho g d$$

- When immersed in a fluid, an object feels an (upward) BF equal to the weight of the displaced fluid. (Archimedes' Principle)

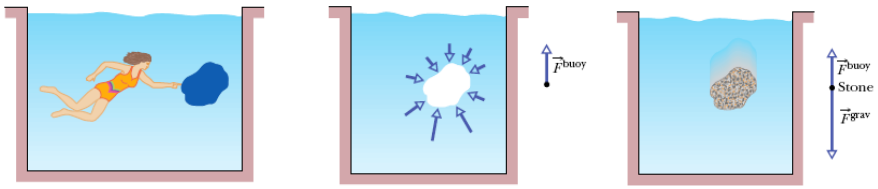
Reading Questions

- Why are we allowed to attach a direction to area when its not truly a vector?
- I'm a little confused about how the area can be a vector? What would a negative area indicate?



Making sense of AP

- Consider the forces on a bag of water the same shape as an immersed object.



- The BF is equal to the weight of the water displaced – that's what the surrounding water can hold up!

Reading questions

- How would you calculate the upward buoyant force if the bottom of a submerged object is not flat ie. perpendicular to the upward buoyant force. For instance, if I submerged a beach ball, would I just use 12 the SA of a sphere? What about if it was inconsistently shaped, like a rock?