November 5, 2013 Physics 131 Prof. E. F. Redish

- **Theme Music: Queen**

  Under Pressure

- **Cartoon: Bill Watterson**

  Calvin & Hobbes

11/5/13 Physics 131 **1**

Exam 2

- Exam 2 will be held in class on Thursday.
- Slides with the emphasized foothold principles are linked to our Schedule page.
- Solutions to the sample exam will be posted this evening.
- I will hold office hours in the CC W 3-5.
- There will be a Q&A session W 5:30-6:50 in this room.

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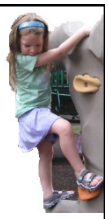
Foothold ideas: Pressure 1

- In a gas the molecules are moving very fast in all directions. On the average the momentum cancels out.
- If you put in a wall keeping the gas on only one side, only the momentum in one direction acts on the wall (N2, N3), creating a force.
- In a non-flowing gas, the force/area is a constant, the pressure. It is proportional to the number of molecules and their mv^2.

Foothold ideas: Liquids

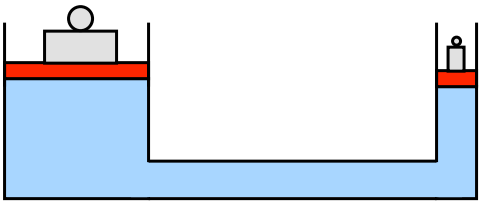


- In a liquid the molecules are close enough that their mutual (short ranged) attractions hold them together (e.g. H-bonding in H_2O).
- A liquid maintains its volume but changes its shape easily in response to small forces.
- The relation of p, V, and T in a liquid is WAY more complicated than in a gas.

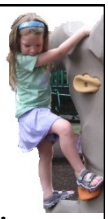
Pascal's Principle

A force exerted on a part of a fluid is transmitted through the fluid and expressed in all directions.

$$\frac{W_1}{A_1} = \frac{W_2}{A_2}$$



Foothold ideas: Pressure 2



- 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. (N0, N2)

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

- The pressure in a fluid is the same on any horizontal plane no matter what the shape or openings of the container. (Vessel shaped like Utah.)