Announcements

- Quiz 5 next week (be sure to register for TAM 211 separately)

- Upcoming deadlines:
  - Tuesday (4/9): PL HW12
  - Friday (4/12): Written Assignment
Fluid Pressure
Mechanics is a branch of the physical sciences that is concerned with the state of rest or motion of bodies that are subjected to the action of forces.

SOLIDS
Rigid Bodies
TAM 210/211: Statics
TAM 212: Dynamics

FLUIDS
Deformable Bodies
TAM 251: Solid Mechanics

T = 16 in.
What Makes a Fluid or Solid?

Honey

Rock
They look like a fluid...

Cornstarch + water =

(small, hard particles)

(Mythbusters)
Fluids

**Pascal’s law:** A fluid at rest creates a pressure $p$ at a point that is the same in all directions.

**Incompressible:** An incompressible fluid is one for which the mass density is independent of the pressure $p$. Liquids are generally considered incompressible. Gases are compressible, but may be approximated as incompressible if the pressure variations are relatively small.
Observe that the pressure varies *linearly* from the free surface, and is *constant* along any horizontal plane (since $h$ is constant):

$$p = \rho gh$$

- static fluid pressure

Pressure = \text{density} \cdot \text{gravitational constant} \cdot \text{depth}

\begin{align*}
\text{[m]} \cdot [\frac{m}{s^2}] \cdot [m] &= \frac{N}{m^2} = \frac{N}{m^2}
\end{align*}
The tank is filled with water to a depth of $d = 4$ m. Determine the resultant force the water exerts on side $A$ of the tank. ($\rho = 1000$ kg/m$^3$)

$$F_R = \int w \, dx = \text{Area under the curve.}$$

$$F_R = \frac{1}{2} \rho d \cdot (2m) = \frac{1}{2} (\rho gd)(2d)$$

$$\rightarrow F_R = \rho gd^2$$
Determine the magnitude and location of the resultant hydrostatic force acting on the submerged rectangular plate AB. The plate has width 1.5 m. \( (\rho_{\text{water}} = 1000 \text{ kg/m}^3) \)

\[
F_R = V_R = \frac{1}{2} (P_a + P_b) h d = \frac{1}{2} \rho g (h_1 + h_2) h d
\]

- \( h = 3 \text{ m} \)
- \( d = 1.5 \)
- \( P_a = \rho g l_1 \)
- \( l_1 = 2 \text{ m} \)
- \( P_b = \rho g l_2 \)
- \( l_2 = (2 + 3) = 5 \text{ m} \)