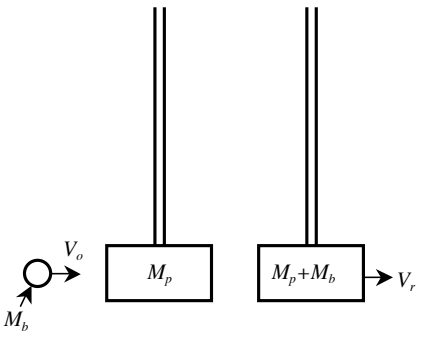
Ballistic Pendulum

- Use two different methods to find the launch speed of a "gun"
  - Conservation of momentum + conservation of energy

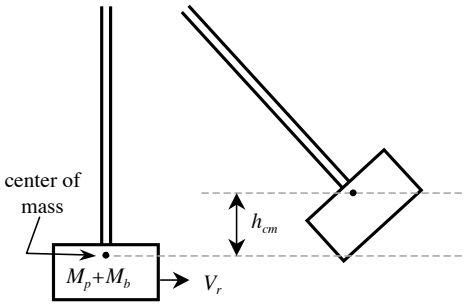
Conservation of linear momentum
(Before and immediately after the collision)



$$M_b V_0 = (M_p + M_b)V_r$$

$$\text{initial velocity } = V_0 = \frac{(M_p + M_b)V_r}{M_b}$$

Conservation of energy
(During the swing of the pendulum arm)



$$\frac{1}{2}(M_p + M_b)V_r^2 = (M_p + M_b)gh_{cm}$$

$$\text{recoil velocity } V_r = \sqrt{2gh_{cm}}$$

  - Projectile motion