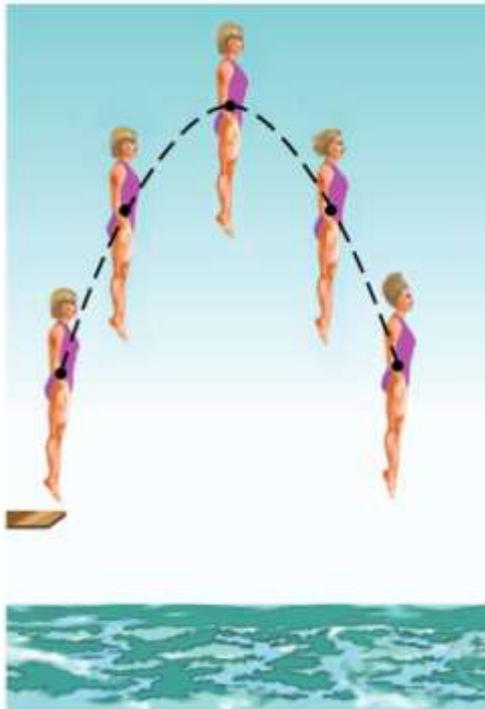


# Center of Mass

There is one point that moves in the same path a particle would take if subjected to the same force as the diver. This point is called the **center of mass (CM)**.



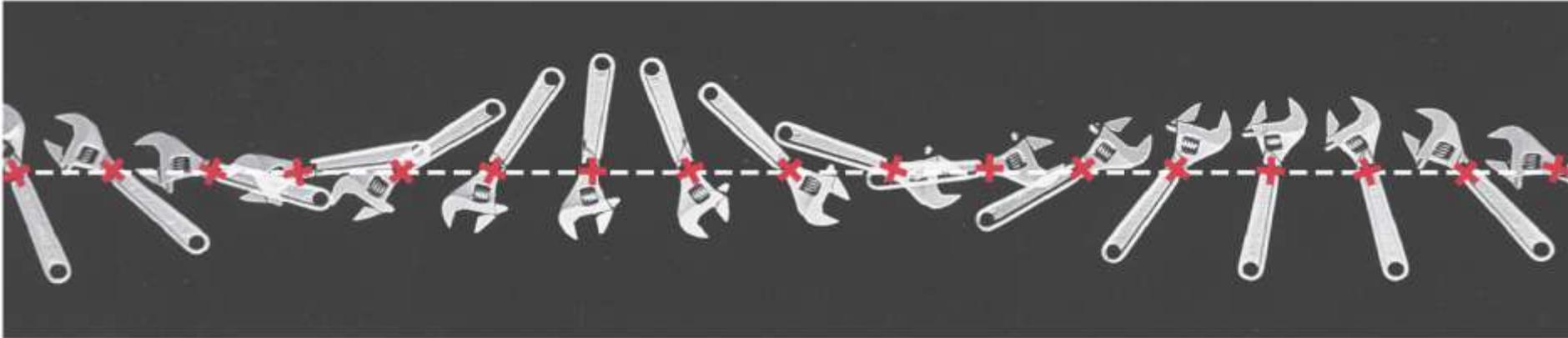
(a)



(b)

# Center of Mass

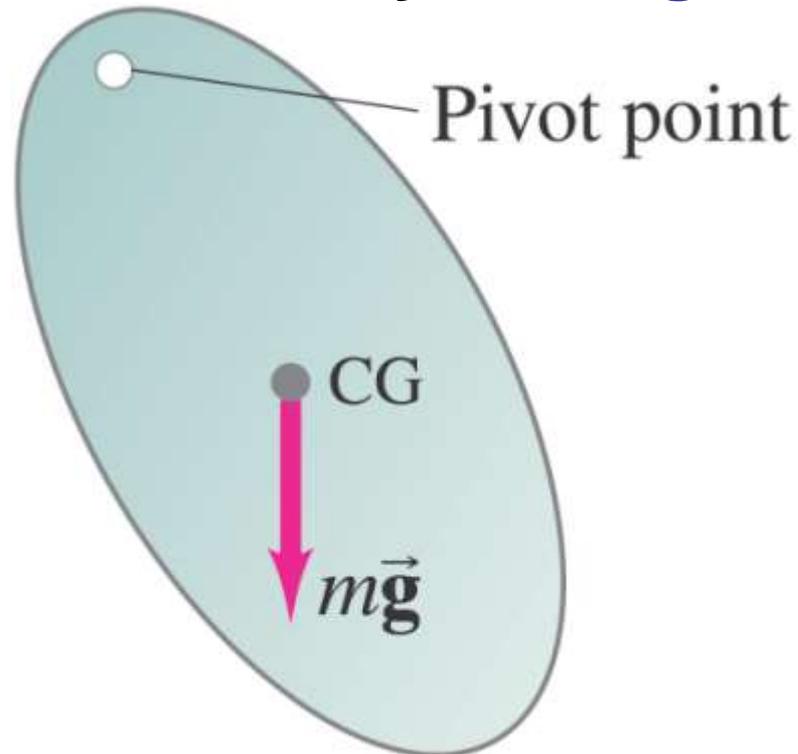
The **general motion** of an object can be considered as the **sum of the translational motion of the CM, plus rotational, vibrational, or other forms of motion about the CM.**



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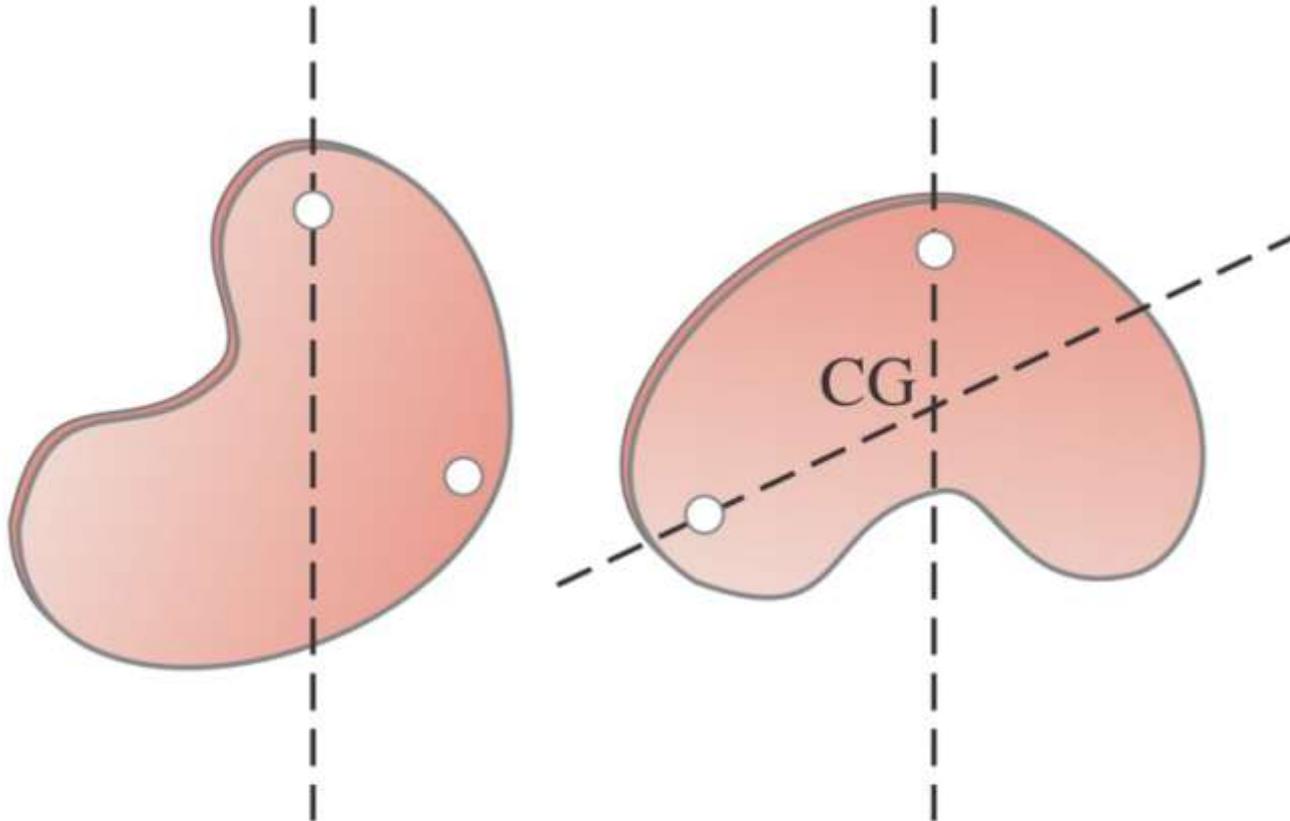
# Center of Mass

The center of gravity is the point where the gravitational force can be considered to act. It is the same as the center of mass as long as the gravitational force does not vary among different parts of the object.

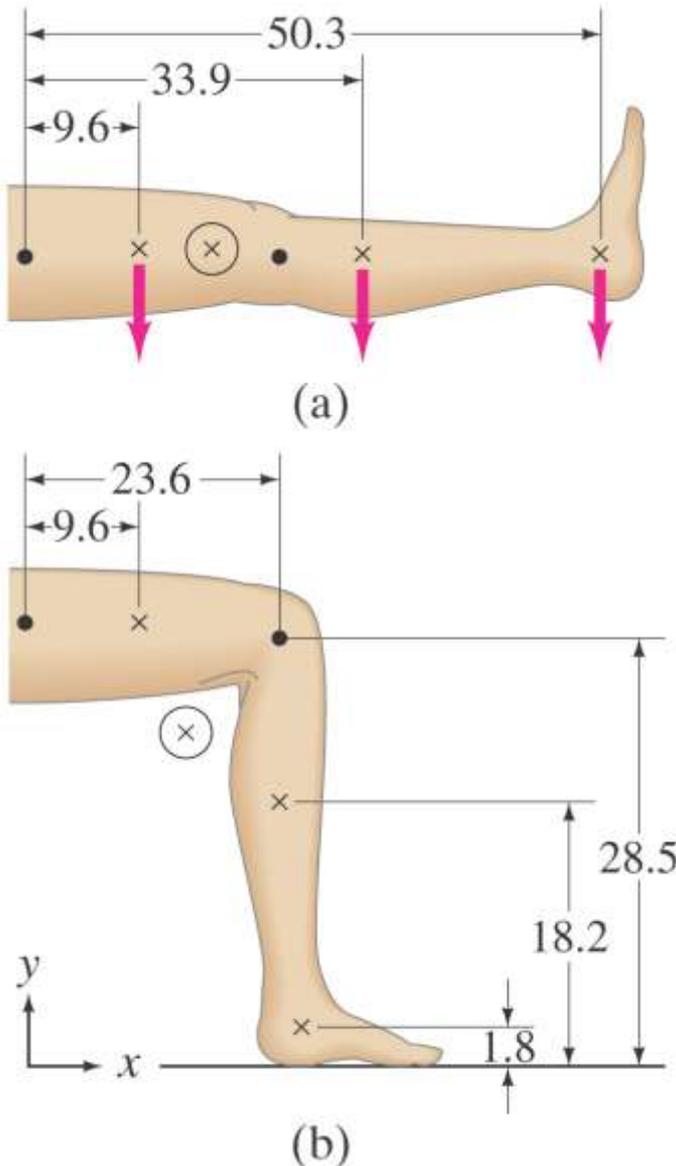


# Center of Mass

The center of gravity can be found experimentally by suspending an object from different points. The CM need not be within the actual object – a doughnut's CM is in the center of the hole.



# CM for the Human Body



The location of the center of mass of the leg (circled) will depend on the position of the leg.

# CM for the Human Body

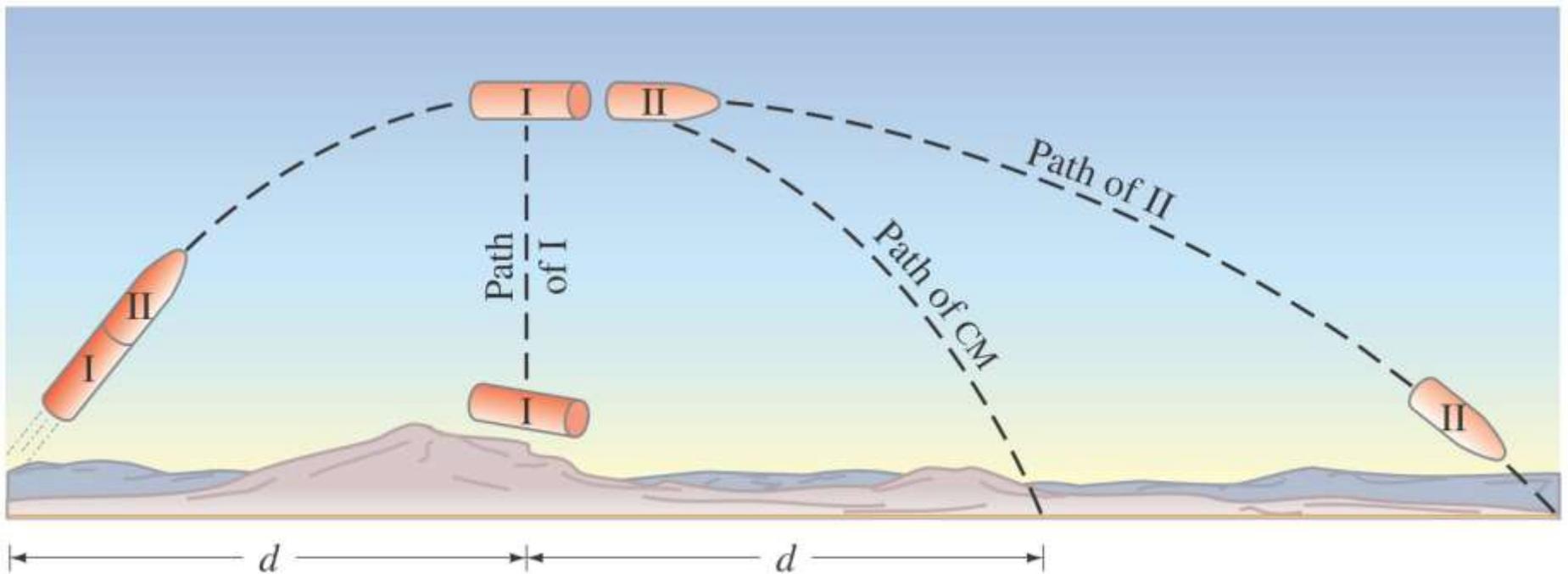


Time for a Gizmo!



# Center of Mass and Translational Motion

This is particularly useful in the analysis of **separations and explosions**; the center of mass (which may not correspond to the position of any particle) continues to move according to the net force.



# Center of Mass and Stability

**Stable Equilibrium: When any displacement raises the center of gravity of an object.**

**Unstable Equilibrium: When any displacement lowers the center of gravity of an object**

**Neutral Equilibrium: When any displacement neither raises or lowers the center of gravity of an object.**

# Stacking Bowling Balls Movie

# **Stacking Bowling Balls in** **Singapore Movie**