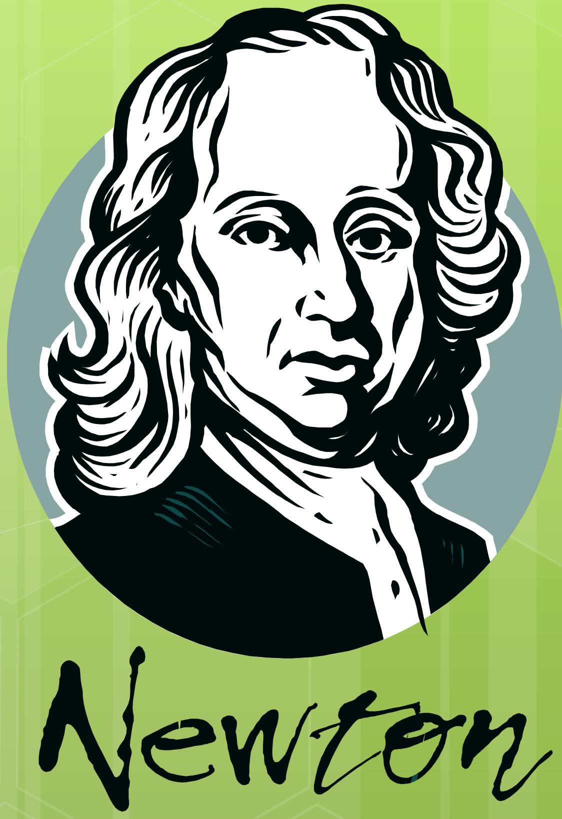


Forces and Newton's Laws

Houston, We Have a Problem! Lesson

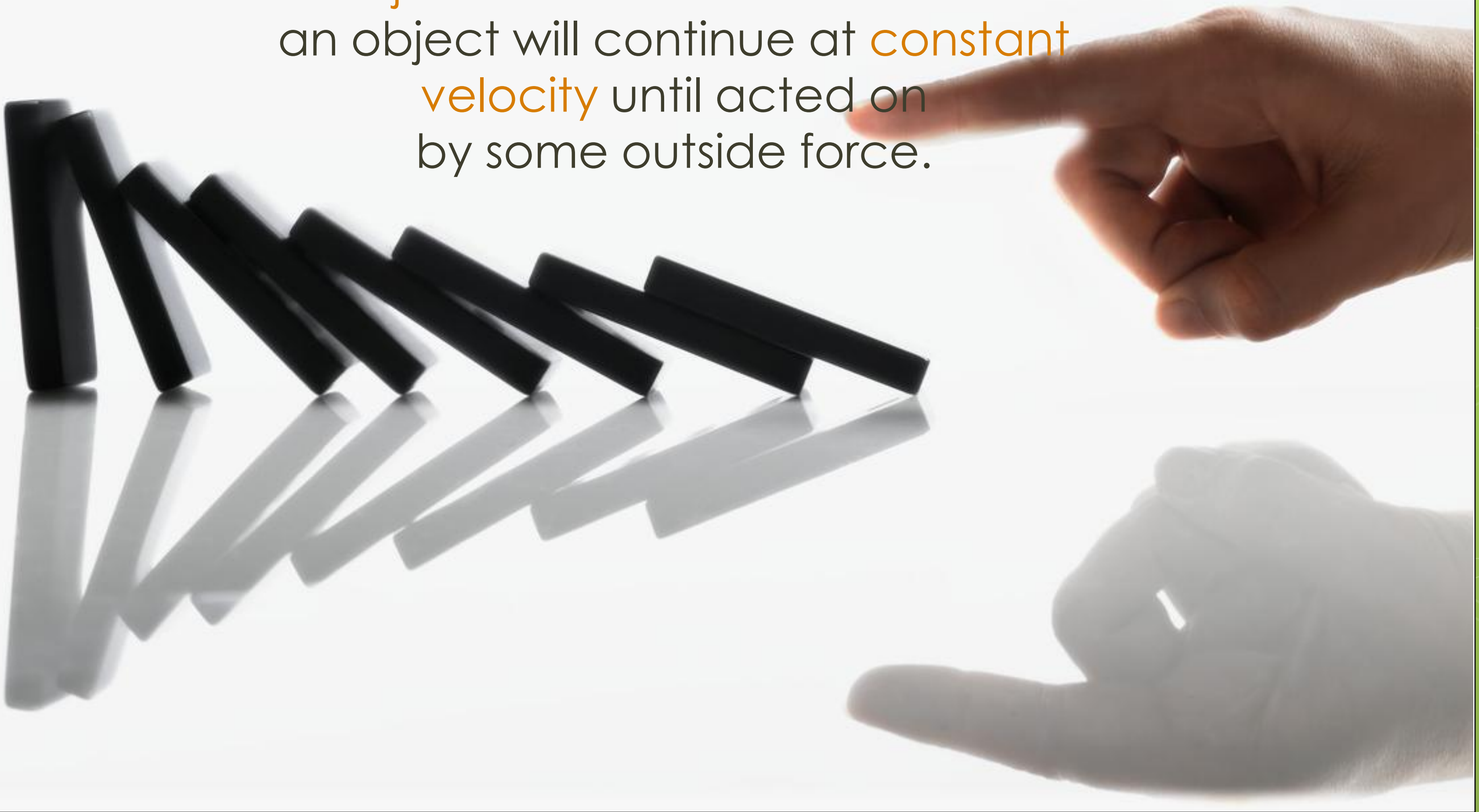
Direct Forces

- A force is a push or a pull.
- It is measured in Newtons (N)

Newton’s First Law

Law of Inertia –

an object at rest will remain at rest or an object will continue at constant velocity until acted on by some outside force.



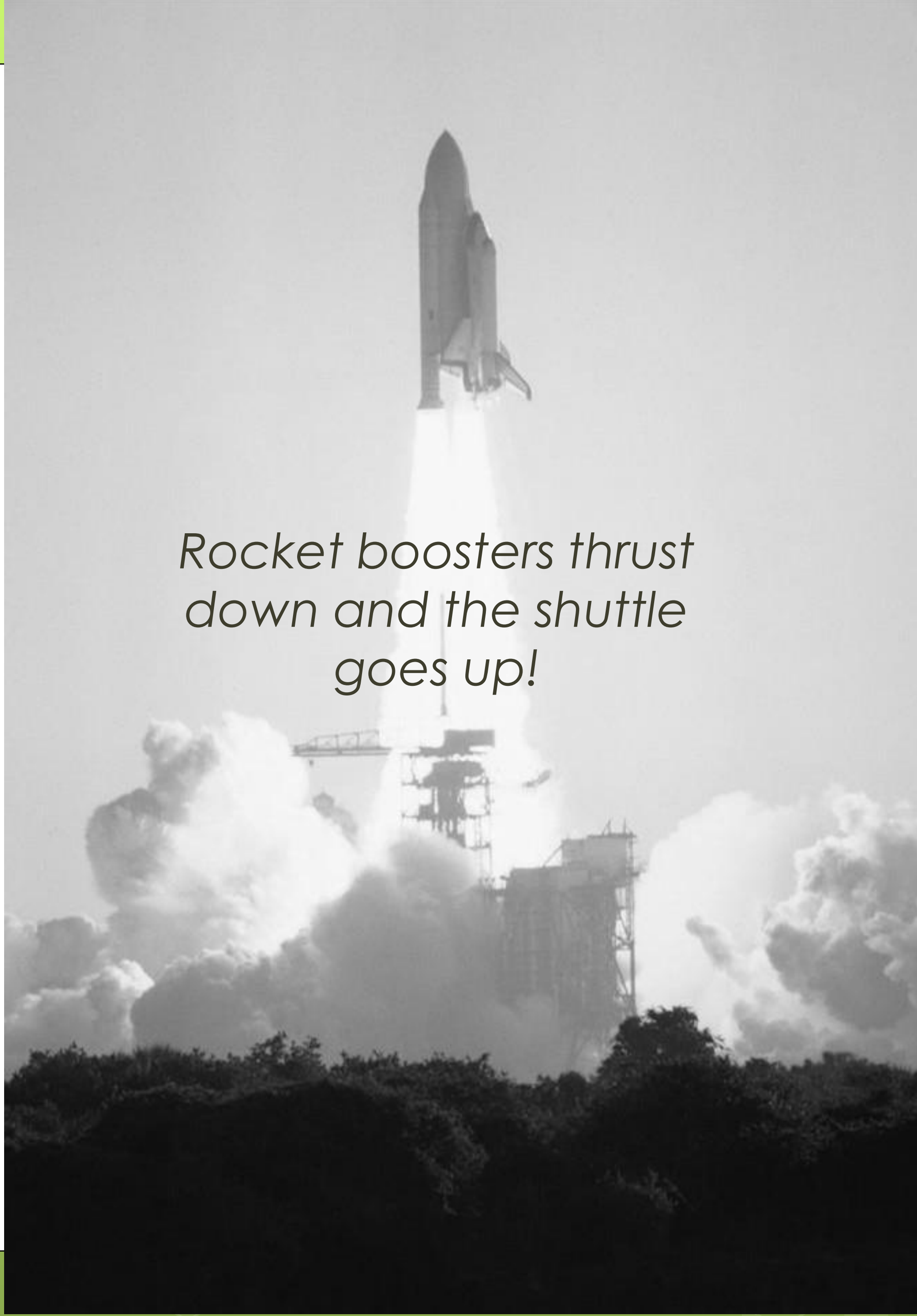
Newton's Second Law

The acceleration of an object is directly proportional to the net force on it and inversely proportional to its mass.

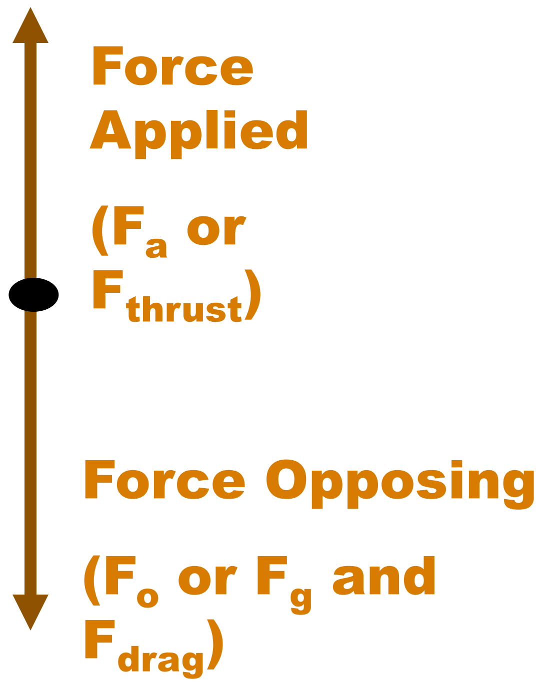
F = ma

Newton's Third Law

For every action, there is an equal reaction in the opposite direction.



Free-Body Diagram: 1



$$F_{Net} = F_a - F_o$$

$$ma = F_{thrust} - F_g - F_{drag}$$

The opposing force is the weight (or force due to gravity, Fg) and air drag of the rocket

Free-Body Diagram: 2

The rocket is *decelerating*

Force Opposing

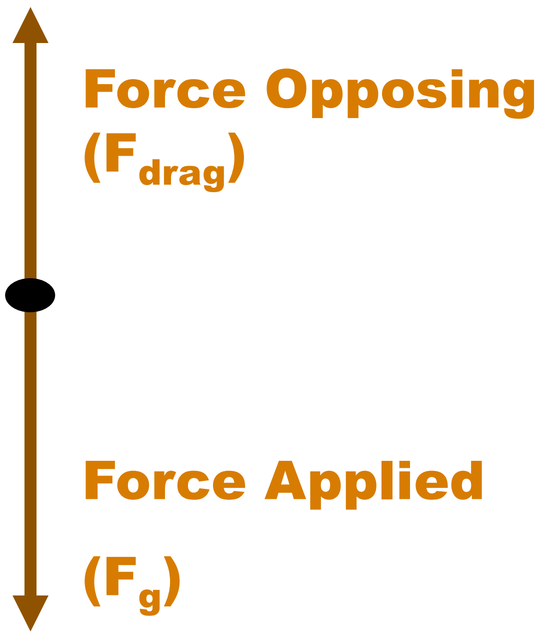
(F_o or F_g and F_{drag})

$$F_{Net} = F_a - F_o$$

$$ma = 0 - F_g - F_{drag}$$

The opposing force is the weight, Fg, and air drag of the rocket.

Free-Body Diagram: 3



$$F_{Net} = F_a - F_o$$

$$ma = F_g - F_{drag}$$

The applied force is the weight, Fg