:: Week 2 ::

Newton's Laws of Motion

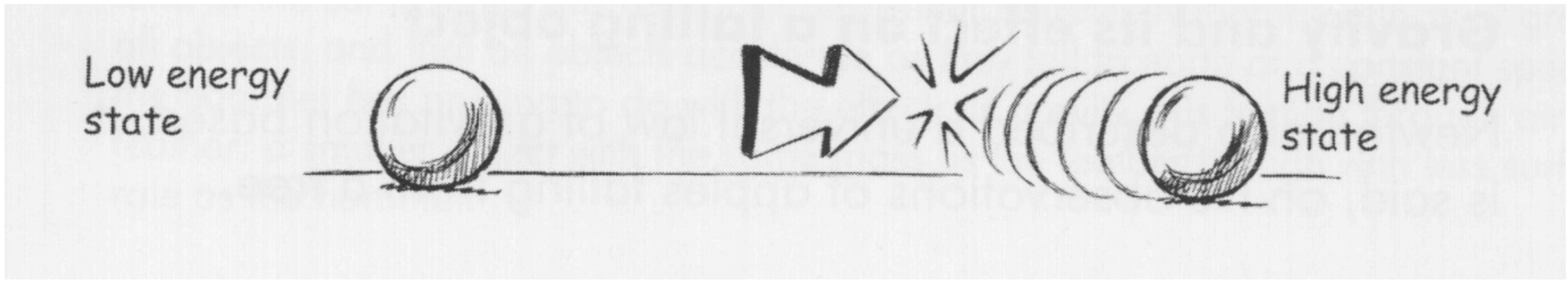
First Law

inertia

Every object that possess mass will remain static until such time that a force is applied to it. Once an object is moving it will continue moving in a straight line in the same direction until it is acted upon by an external force affecting either its speed or direction.

BASICALLY:

An object will continue in its current state of motion unless acted on by a force.

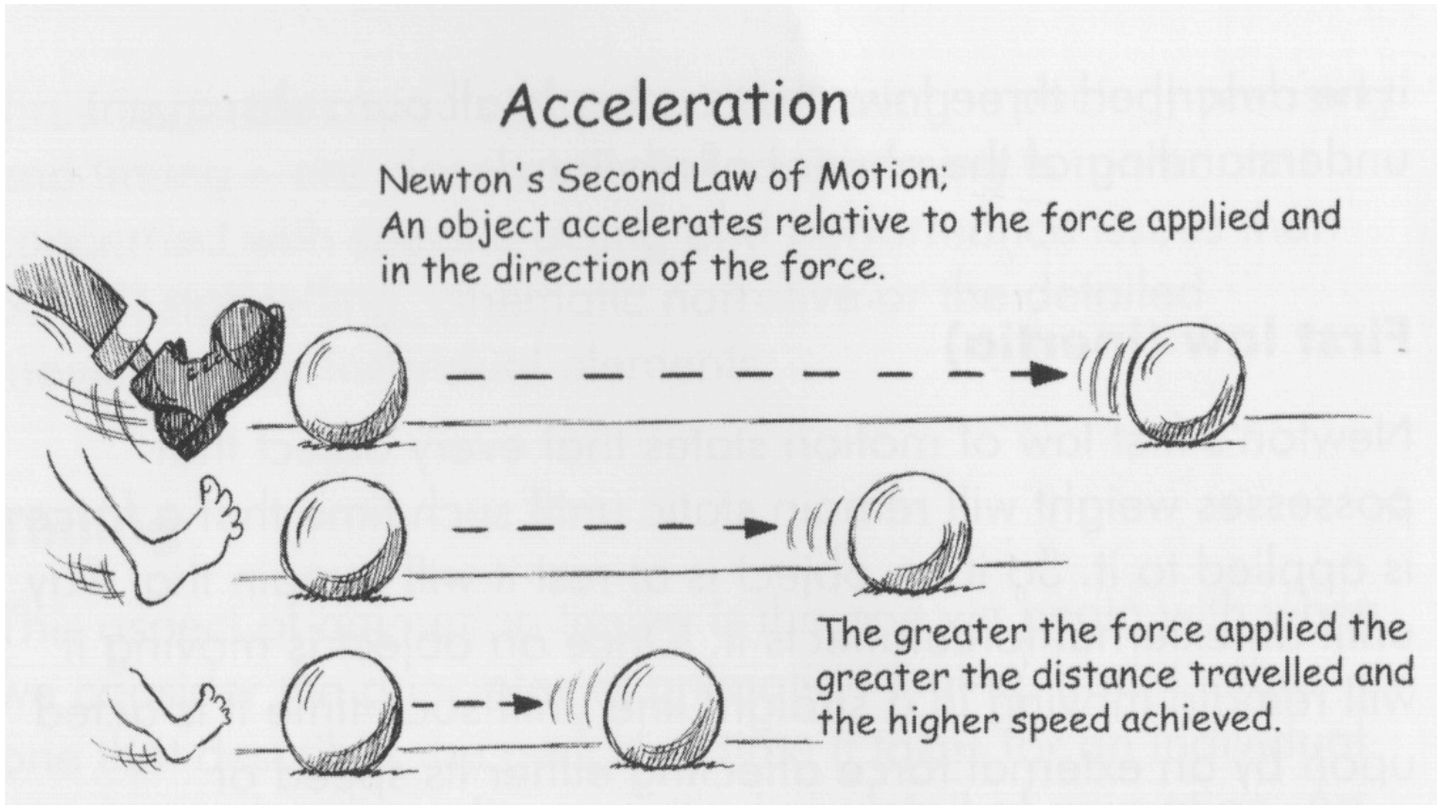


Second Law

constant acceleration

The motion of an object accelerates in the direction of the force applied to it. The greater the force applied to an object, the greater the acceleration will be. The greater the mass of an object, the more inertia the object possesses and therefore the greater the force required to move the object.

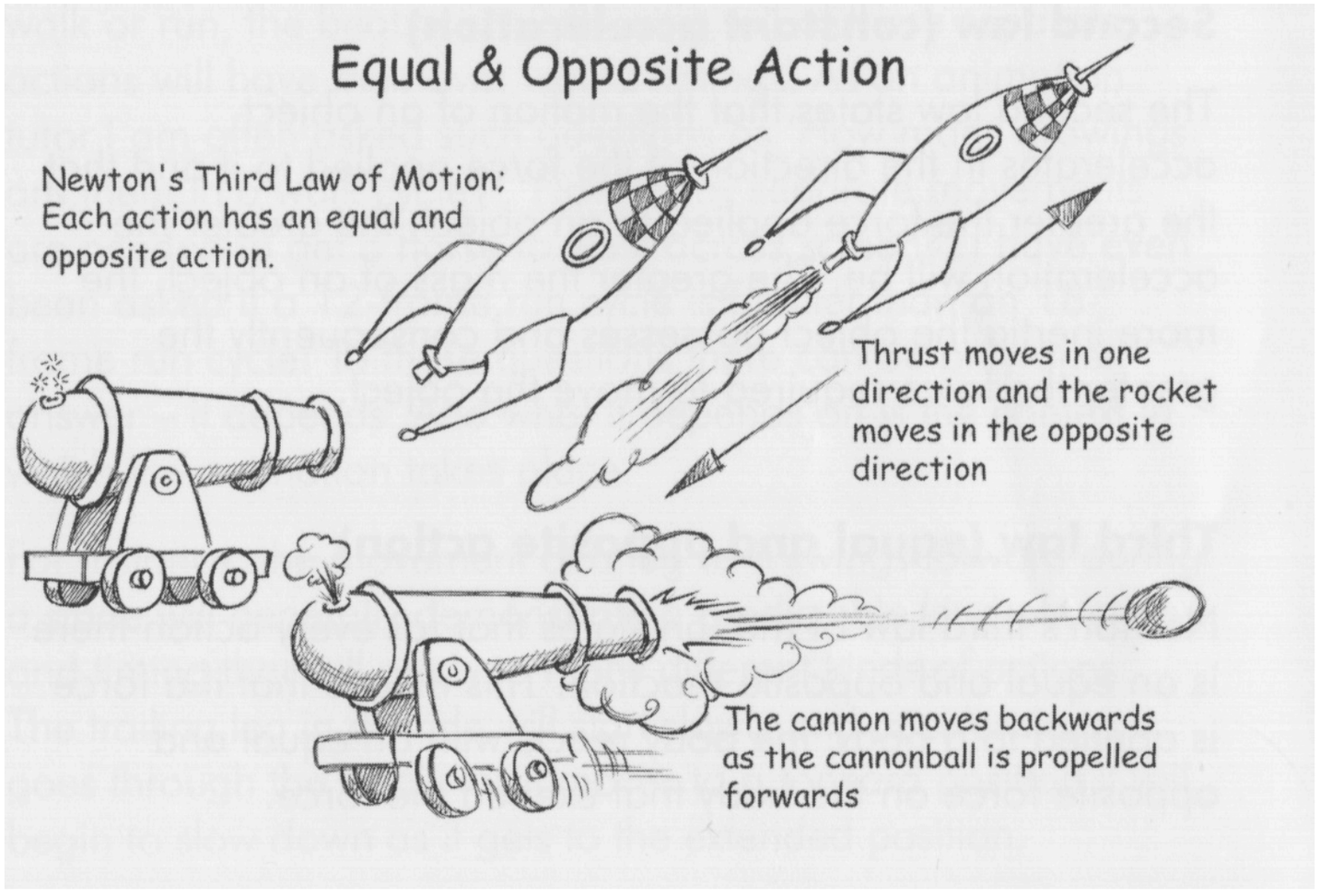
For example: the harder you kick a ball, the further and faster it will travel. Balloons require less energy to move than do tennis balls, which in turn are easier to move than bowling balls.



Third Law

equal and opposite reaction

For every action there is an equal and opposite reaction for the same length of time. If a force is applied to a body, the body reacts with an equal and opposite force on the body that exerted the force.

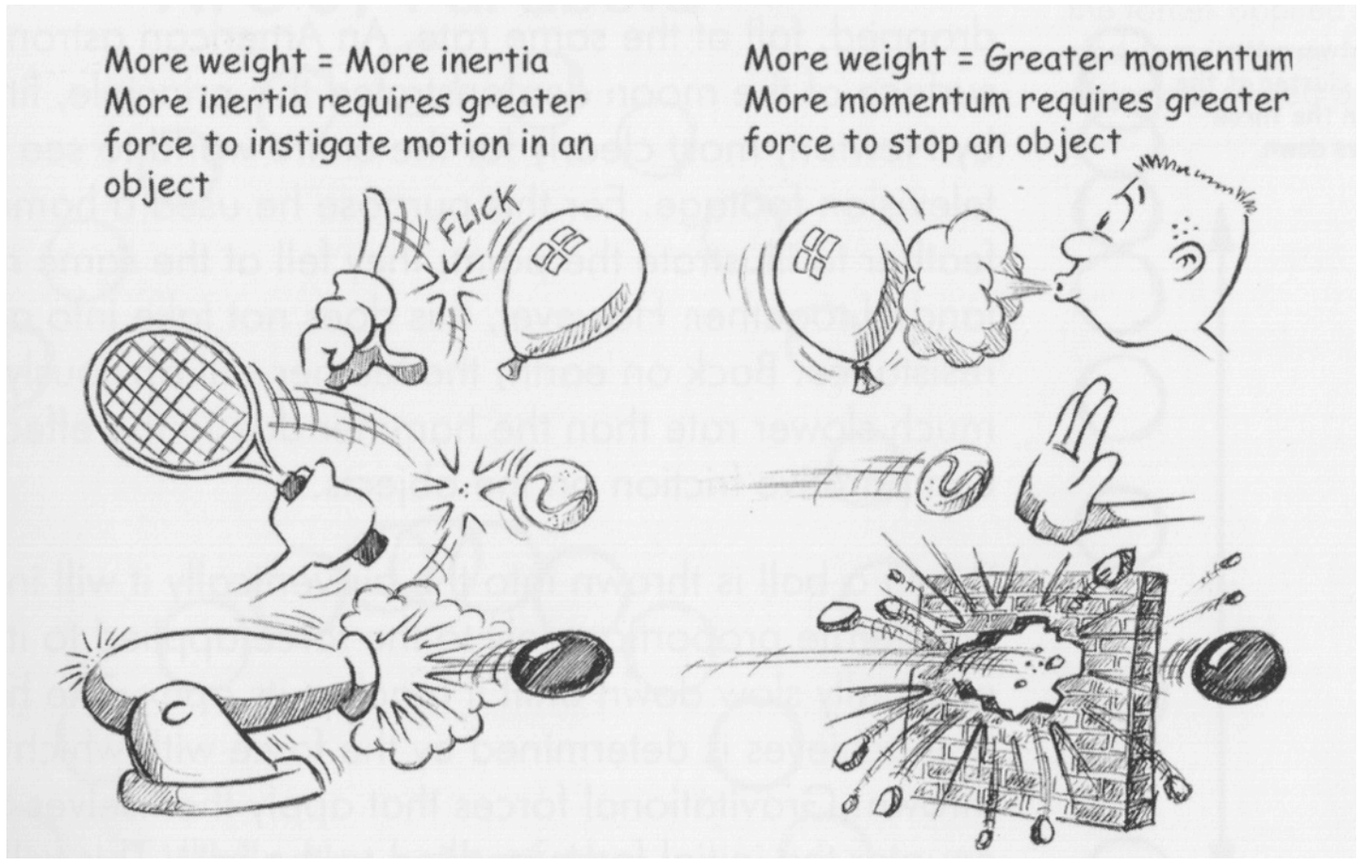


Momentum

and Timing

Once an object is moving it possess momentum. The more momentum an object possesses the further it will travel and the greater the opposing force needed to bring the object to rest.

Momentum is a combination of mass and speed.



A light object may get to top speed faster than a heavy object (heavy objects need more inertia than light ones), but a heavy object will require more force and resistance than a lighter object to come to rest.

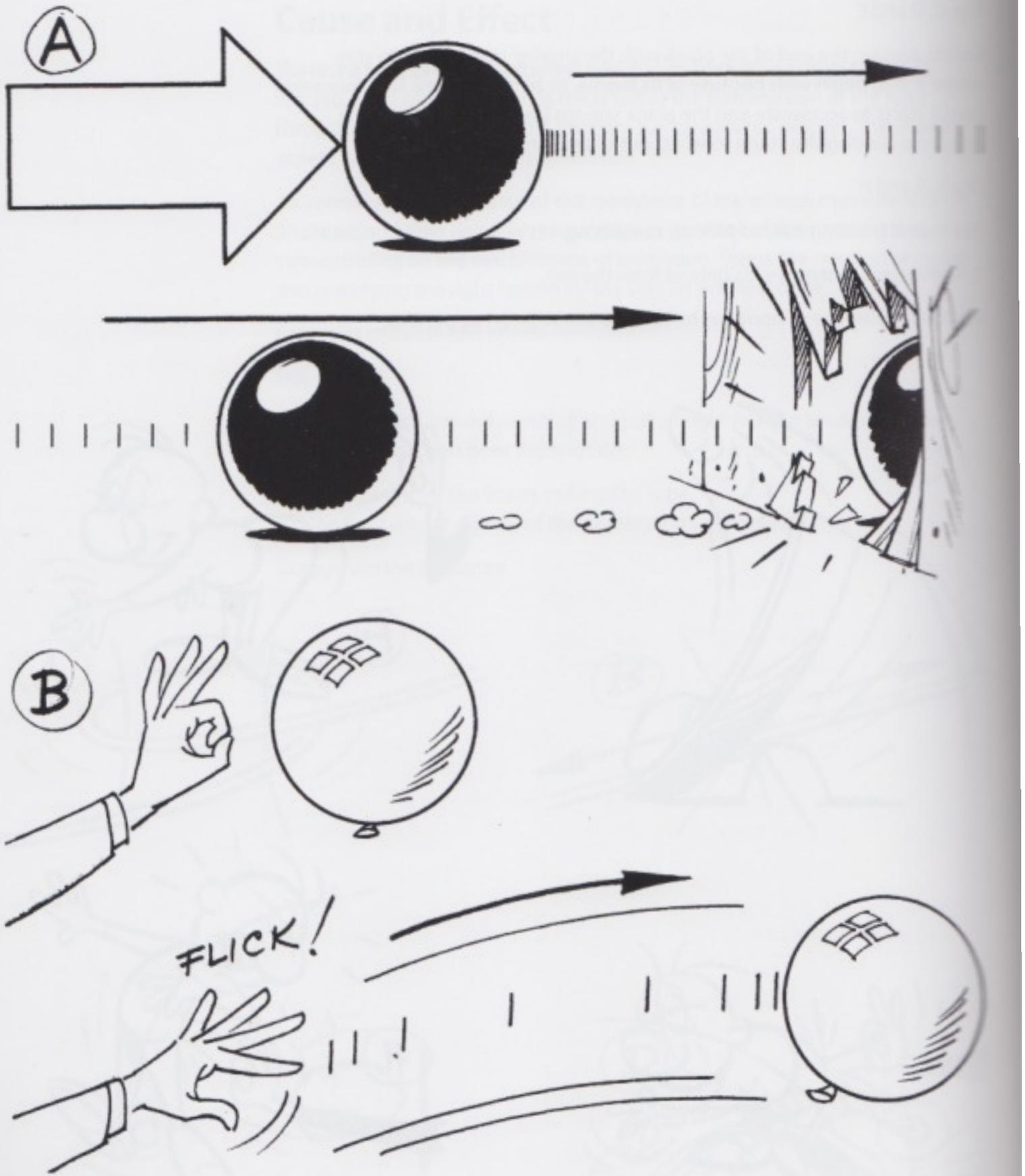


FIGURE 15 **A** A cannon ball needs a lot of force to start it moving. Once moving, it takes a lot of stopping. **B** A balloon needs only a small force to move it, but air resistance quickly brings it to rest. In both these examples a circle is being animated. The timing of its movements can make it look heavy or light on the screen.

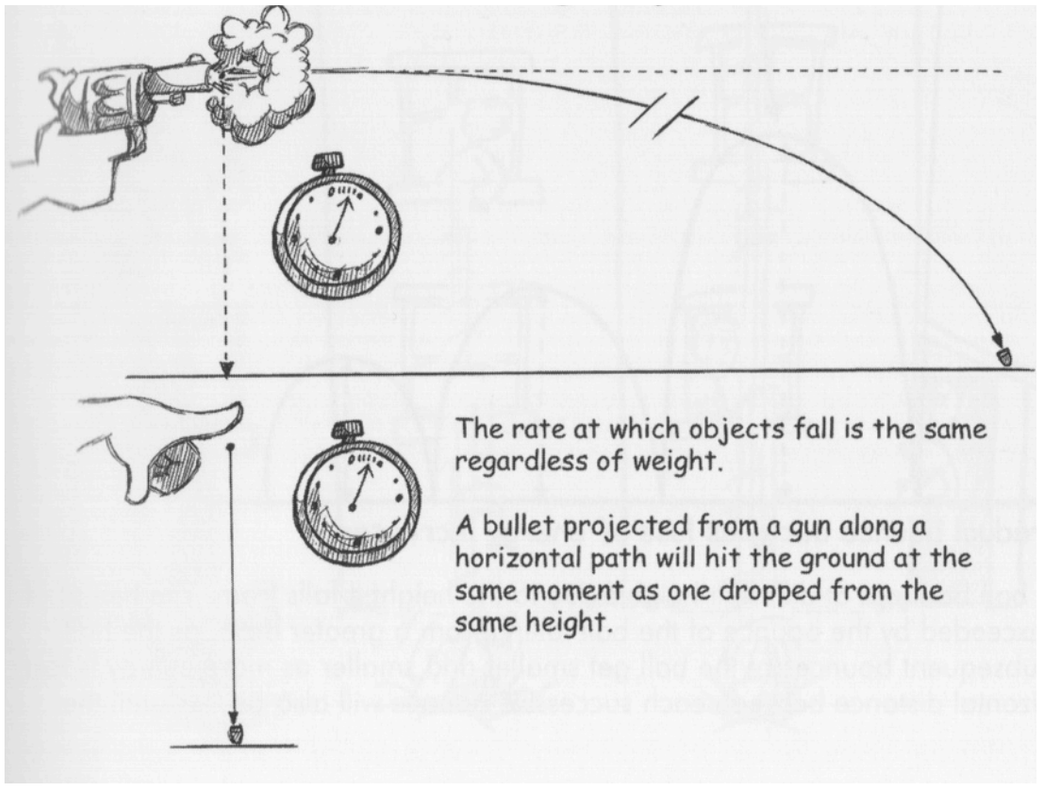
Laws of Motion

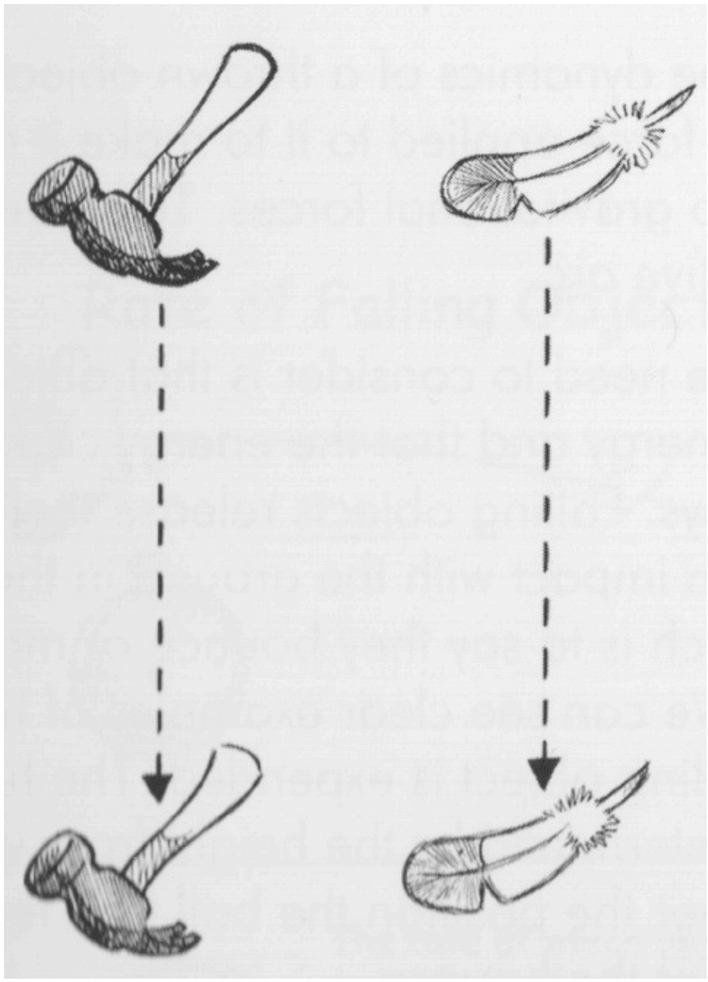
"The greater an object's mass, the MORE force is required to change its motion.

A heavy body has MORE inertia and MORE momentum than a light one."

Gravity
and Galileo

All objects fall at the same rate.



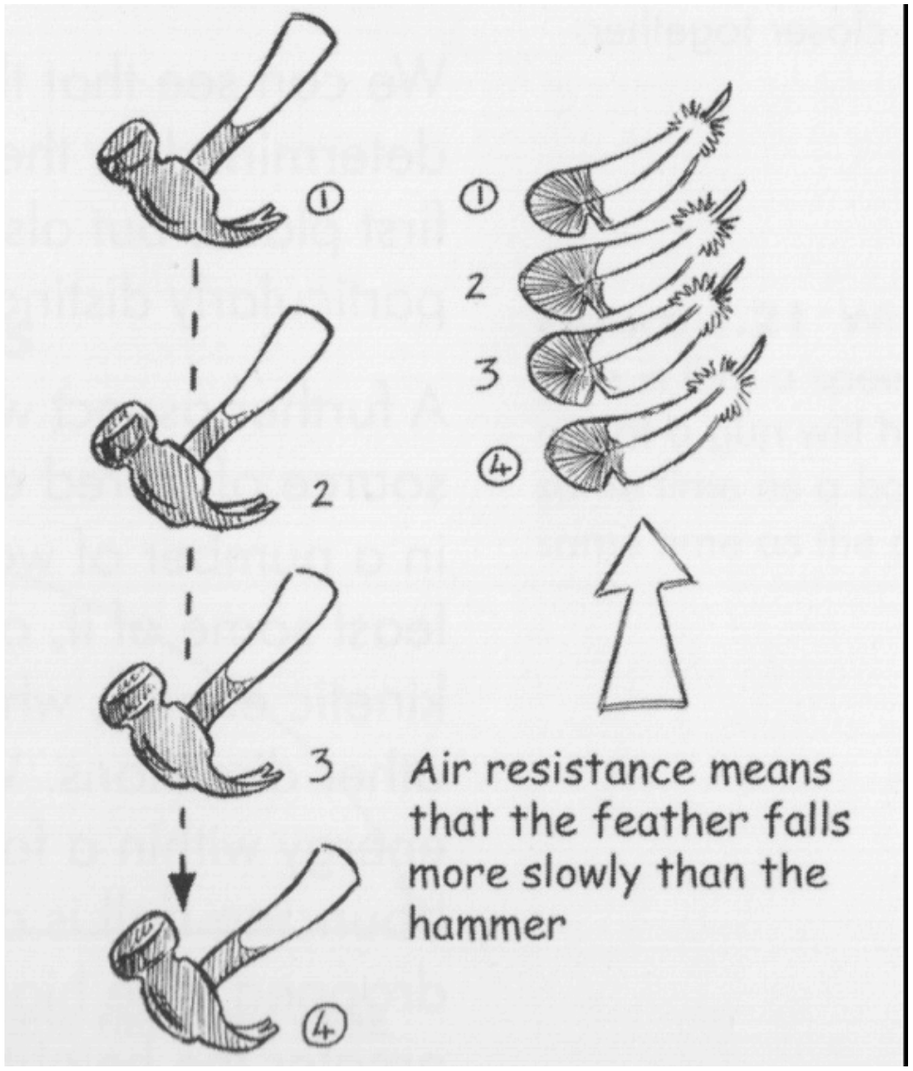


Friction

Friction slows an object.

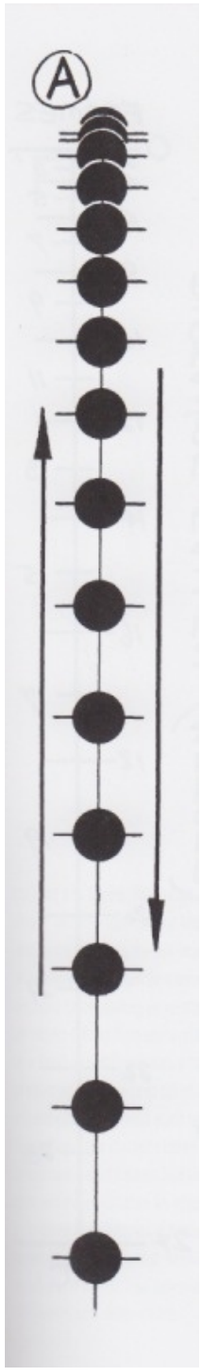
examples:

- through air resistance
- resistance on the ground (rocks, uneven pathway, mud, sand, water, walls)



Where's the Energy?

Dynamics of a vertically thrown object



- object accelerates proportionately to the force applied to it
- object gradually slows until it reaches its apex.
- the height object achieves is determined by force with which it was thrown
- gravity counters this initial force - object slows down until all of the initial energy applied to the object is expended.
- object stops, pauses for a second, then begins to accelerate as it travels back down