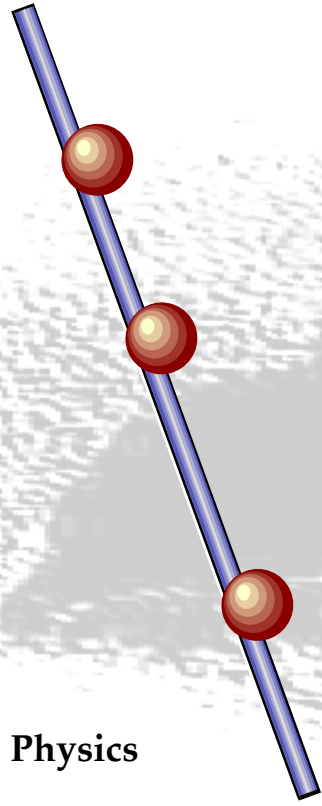


Newton's Laws of Motion



Physics



*"Plato is my friend,
Aristotle is my friend,
but my best friend is
truth"*

Paul Beeken

Why do things move?

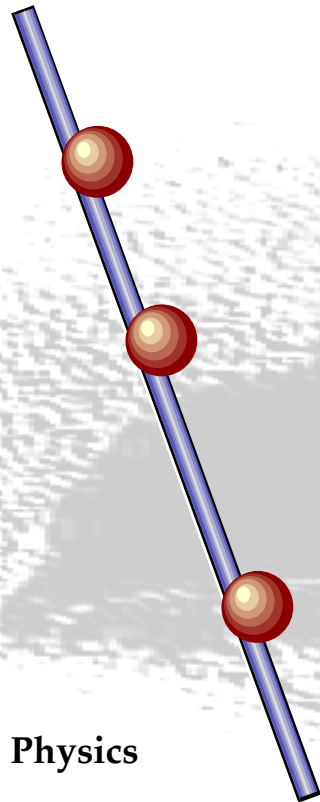


Galileo argued in his “Diologia” that this was the wrong question to ask.

His simple statement, which Newton certainly knew about, was

“Why should they stop?”

First Law



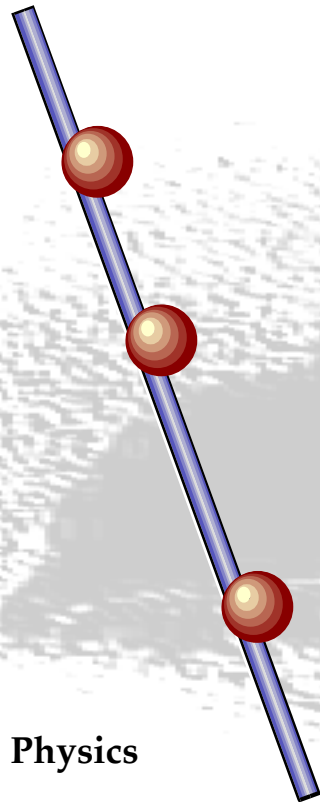
Physics



An object stays in its state of motion (*even if that “motion” is “at rest”*) until compelled to by a **net force**.

Paul Beeken

Second Law



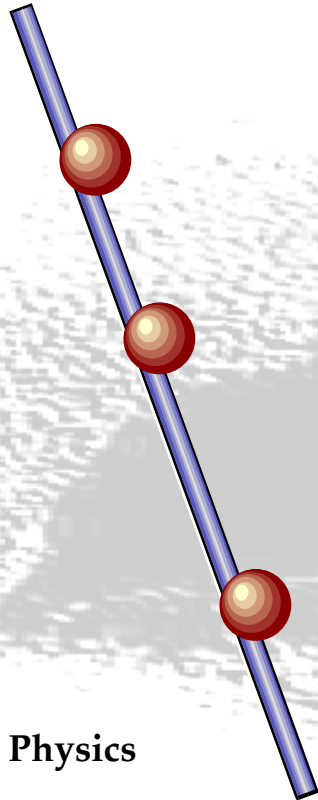
Physics



When a **net force** acts upon an object of mass m the motion that results is an acceleration inversely proportional to that mass m .

Paul Beeken

$$\sum F = F_{net} = m \cdot a \quad \text{Second Law}$$



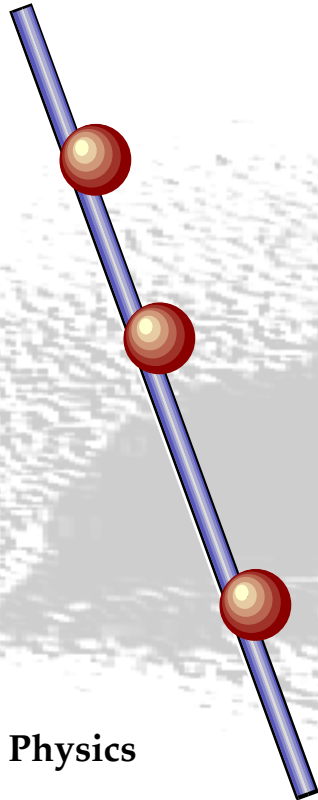
Physics



Said mathematically,
the magnitude of the
acceleration is
inversely proportional
to the mass and
directly proportional
to the **net force**.

Paul Beeken

$$\sum \vec{F} = \vec{F}_{net} = m \cdot \vec{a} \quad \text{Second Law}$$



Physics

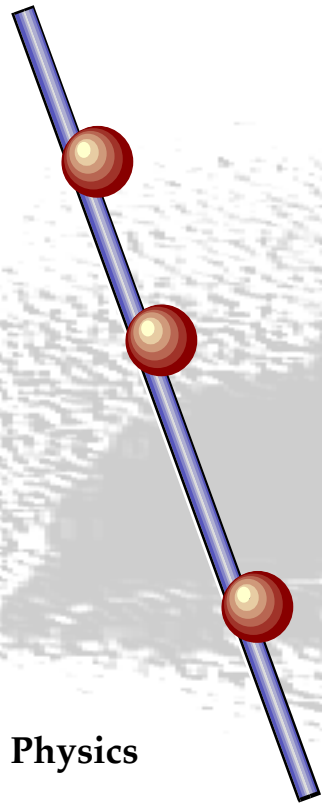


Note that this is a vector equation!

The direction of the force is the same direction as the acceleration.

Paul Beeken

Third Law



Physics

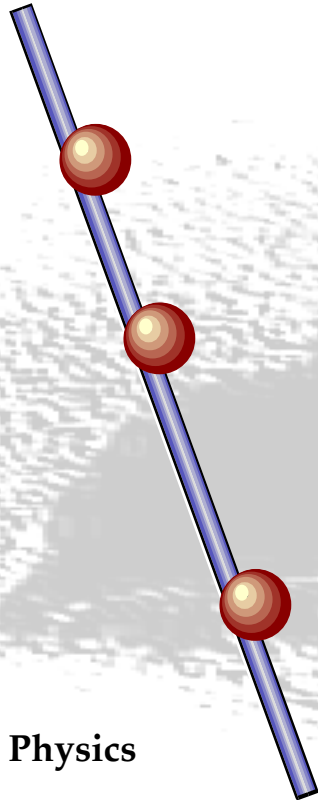


Whenever an object has a force exerted upon it. It, in turn, exerts the same force in the opposite direction upon its pusher.

Paul Beeken

$$\vec{F}_1 = -\vec{F}_2$$

Third Law



Physics



Action - Reaction

**You push, I push
back.**

Eye for an eye.

Paul Beeken

Newton's Laws of Motion



1. An object remains at rest (or moves with constant velocity) until acted upon by a **net force**.
2. An object that “feels” a **net force** will accelerate in that direction.
3. An object that “feels” a force exerts a force which is equal and opposite.