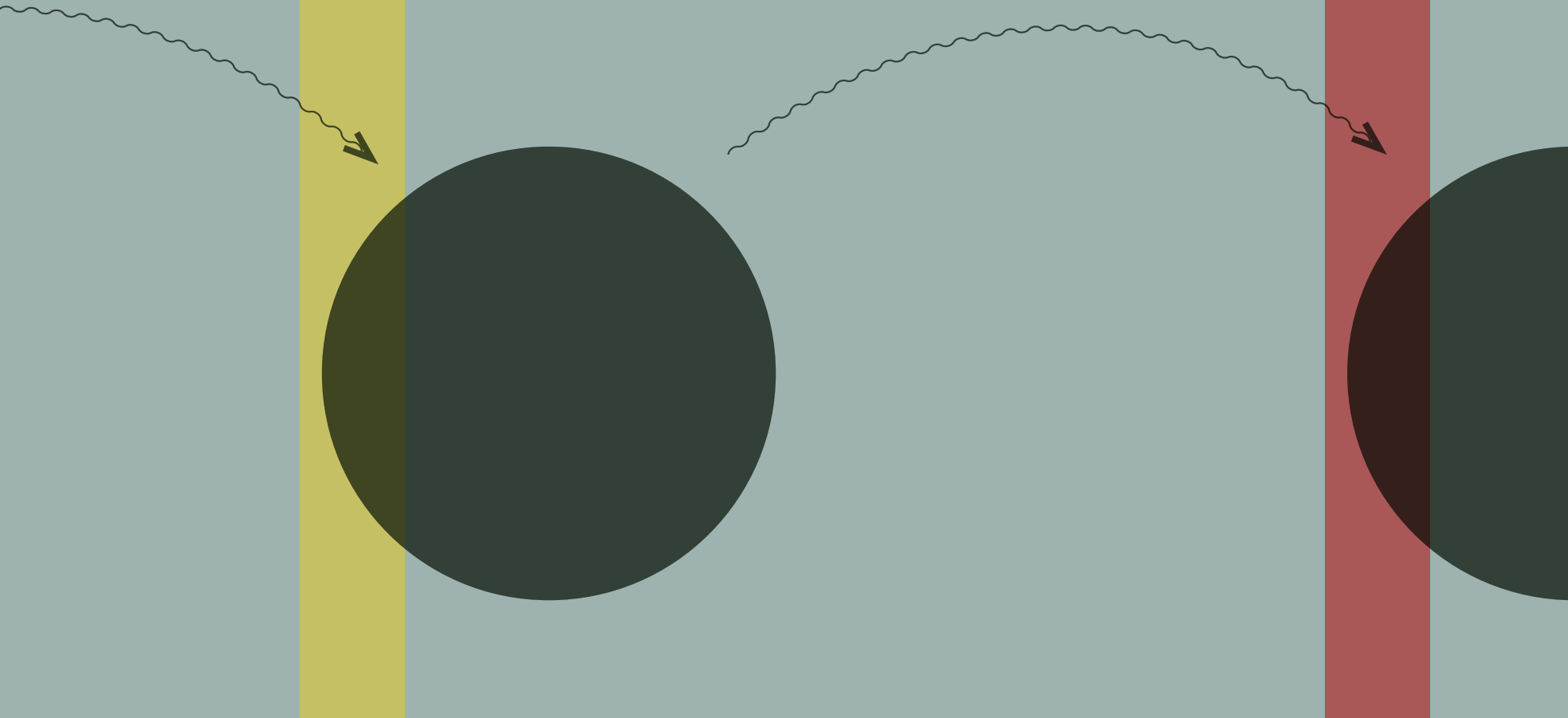
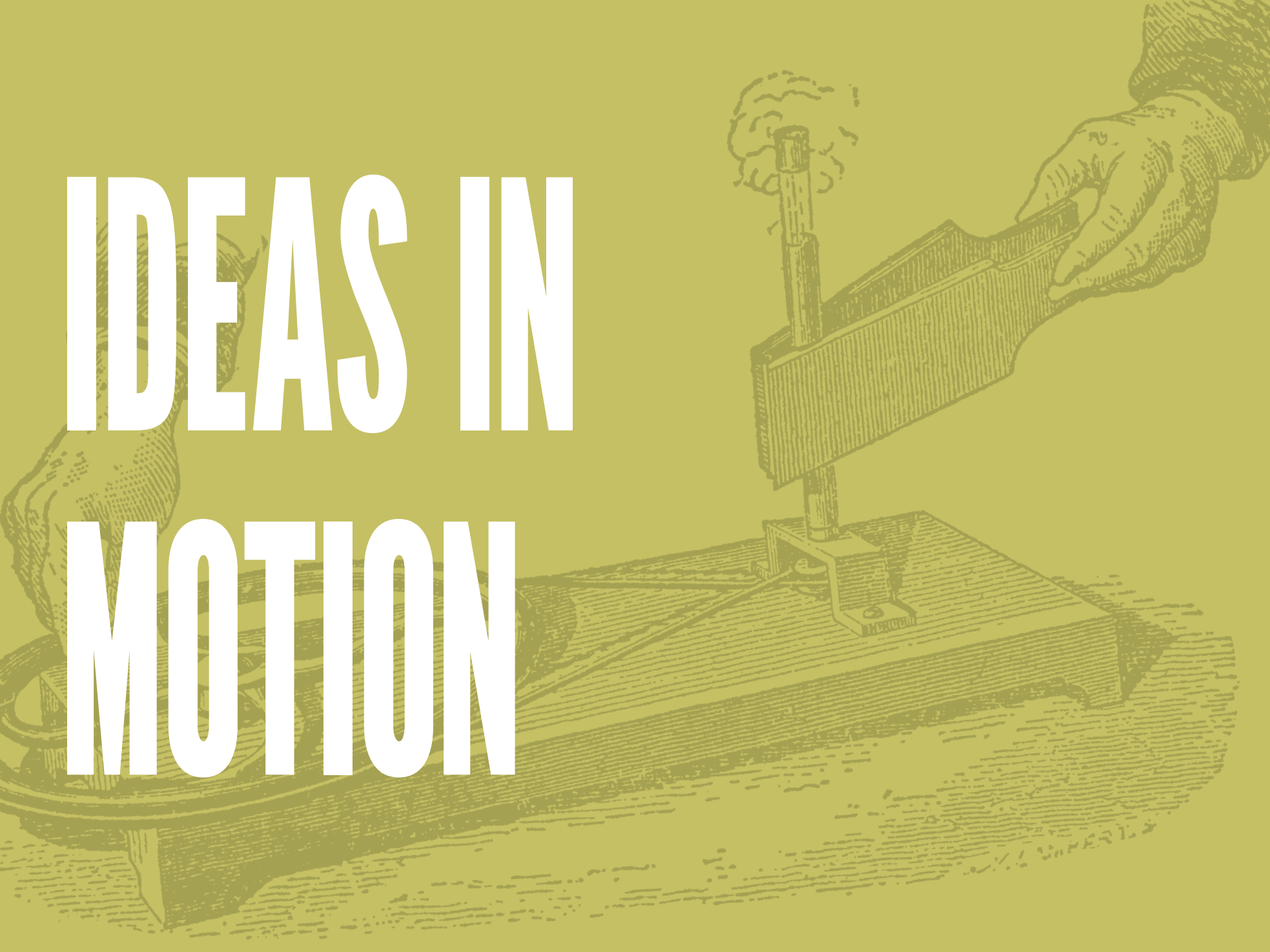


# Motion & Interaction



# IDEAS IN MOTION



**DEFINITION:**

**Motion:**  
*a change in place or  
location over time ...*

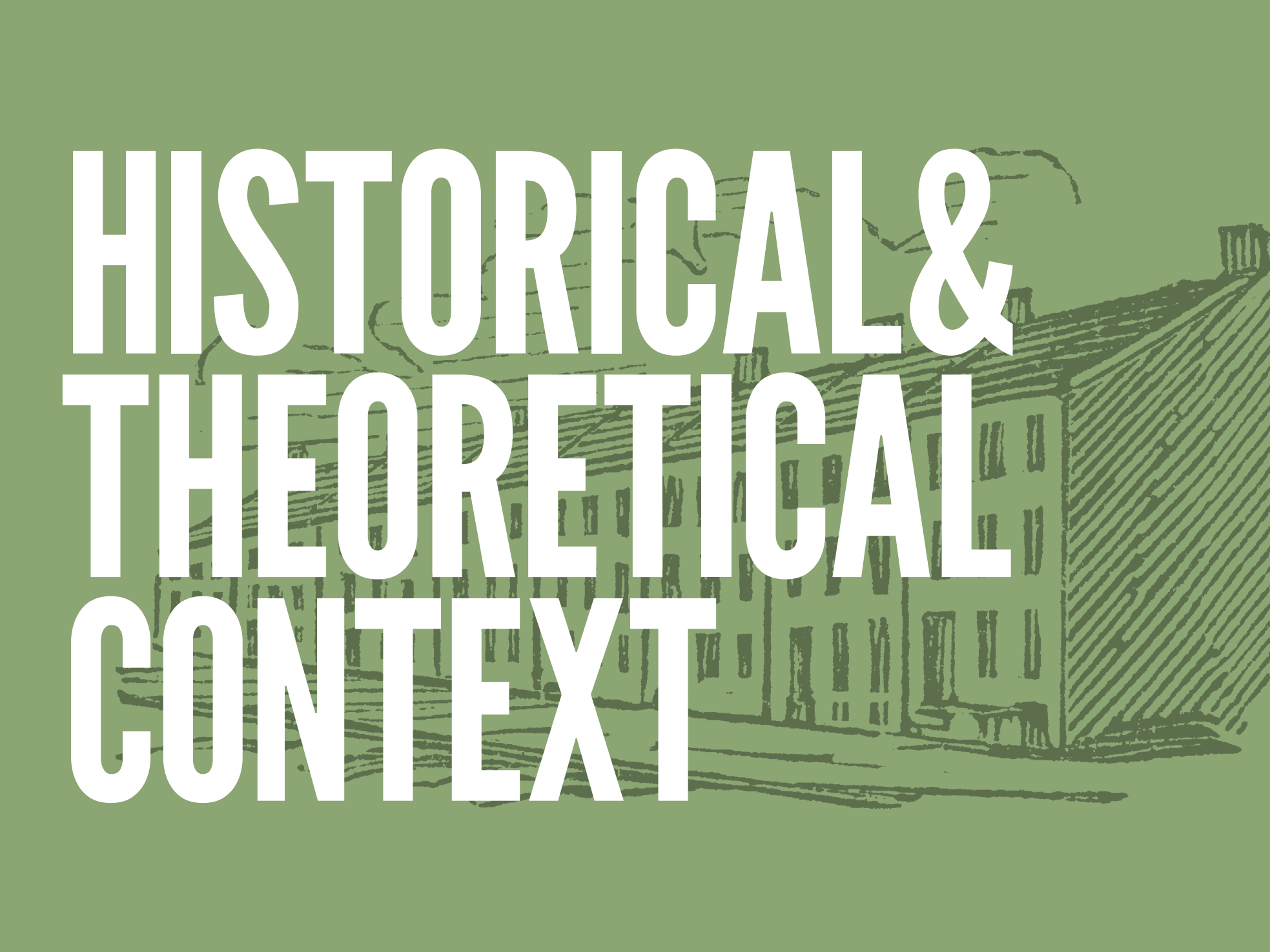
\* This is technically “velocity” in physics



**DEFINITION:**

**Motion:**  
*change over time.*

# HISTORICAL & THEORETICAL CONTEXT

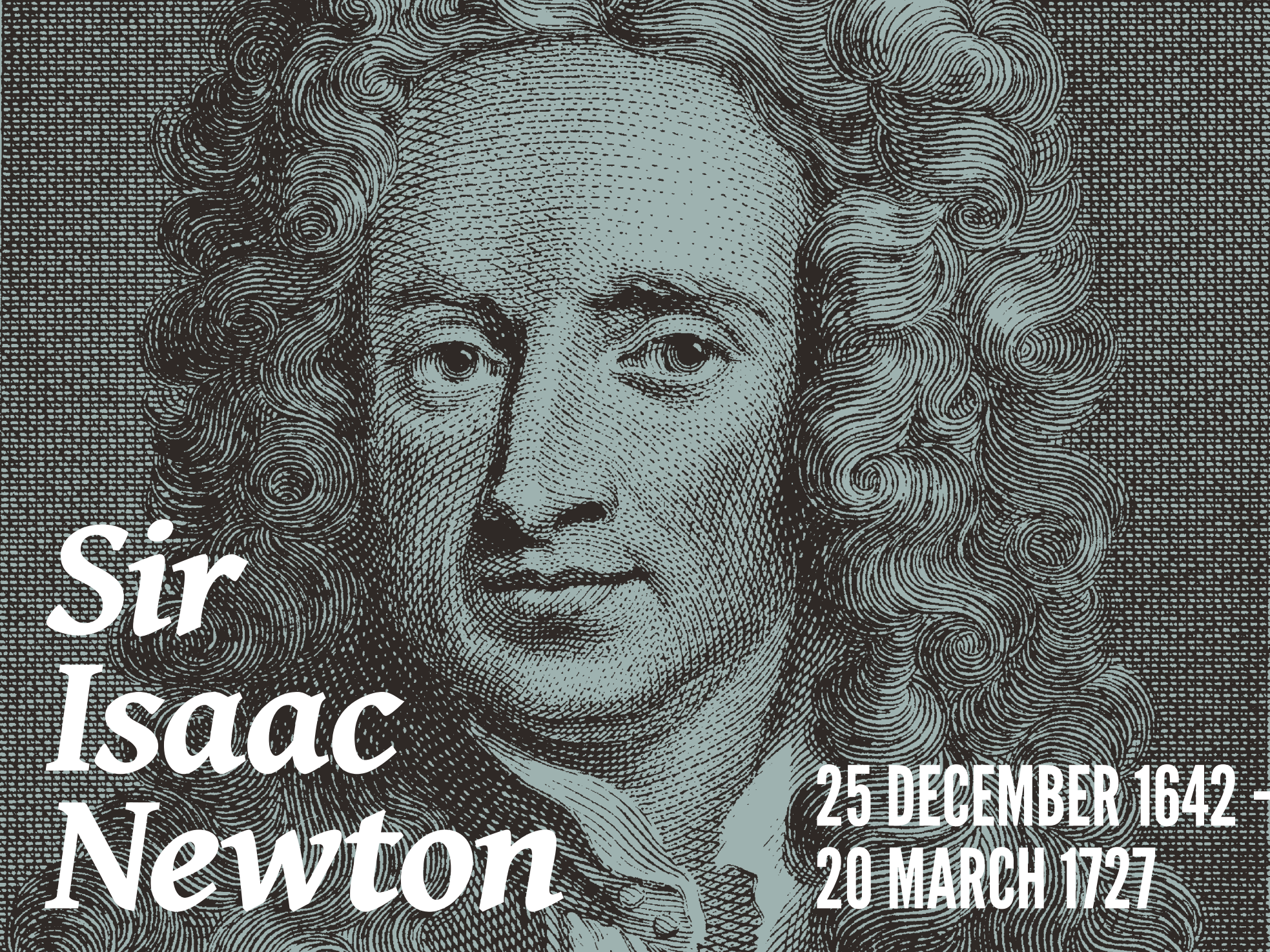




# *Newton*

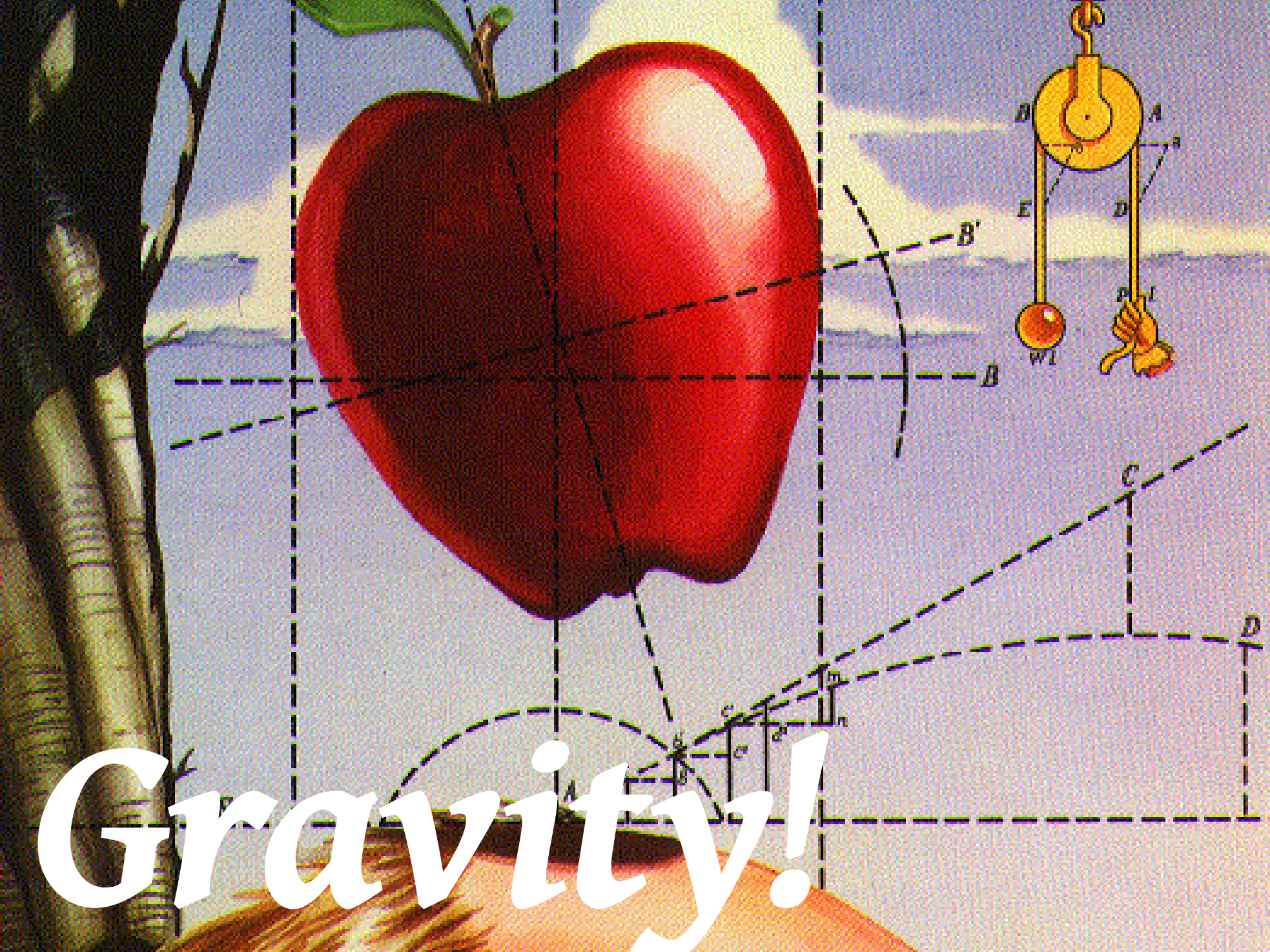
newtonian (or classical) mechanics





*Sir  
Isaac  
Newton*

25 DECEMBER 1642 –  
20 MARCH 1727



Gravity!



$$.5) = \frac{v(8) - v(7)}{8 - 7} = -.1 \frac{\text{miles}}{\text{min}^2}$$

is the total distance traveled in 12 min.

$$\begin{aligned} \text{at} &= \int_0^2 v(t) dt - \int_2^4 v(t) dt + \int_4^{12} v(t) dt \\ &= .2 + .2 + 1.4 = 1.8 \text{ miles} \end{aligned}$$

$$c) \int_0^{12} \frac{\pi}{5} \sin \frac{\pi}{12} t dt$$

$$\frac{\pi}{5} \int_0^{12} \sin u du$$

$$\left[ -\cos\left(\frac{\pi}{12} t\right) \right]_0^{12}$$

$$= 0$$

# Calculus!



# *Newton Disc*

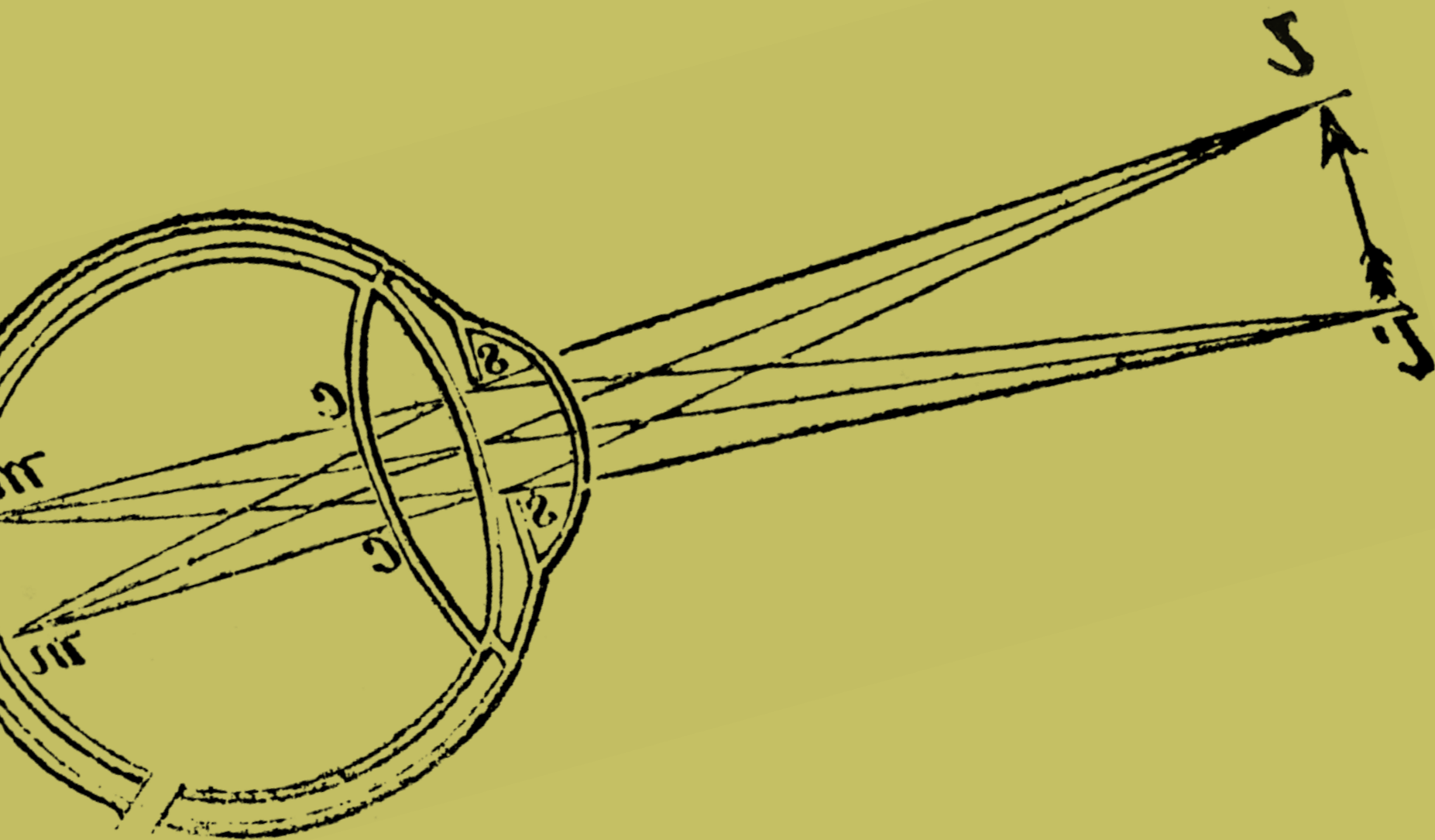
*PERSISTANCE OF VISION*



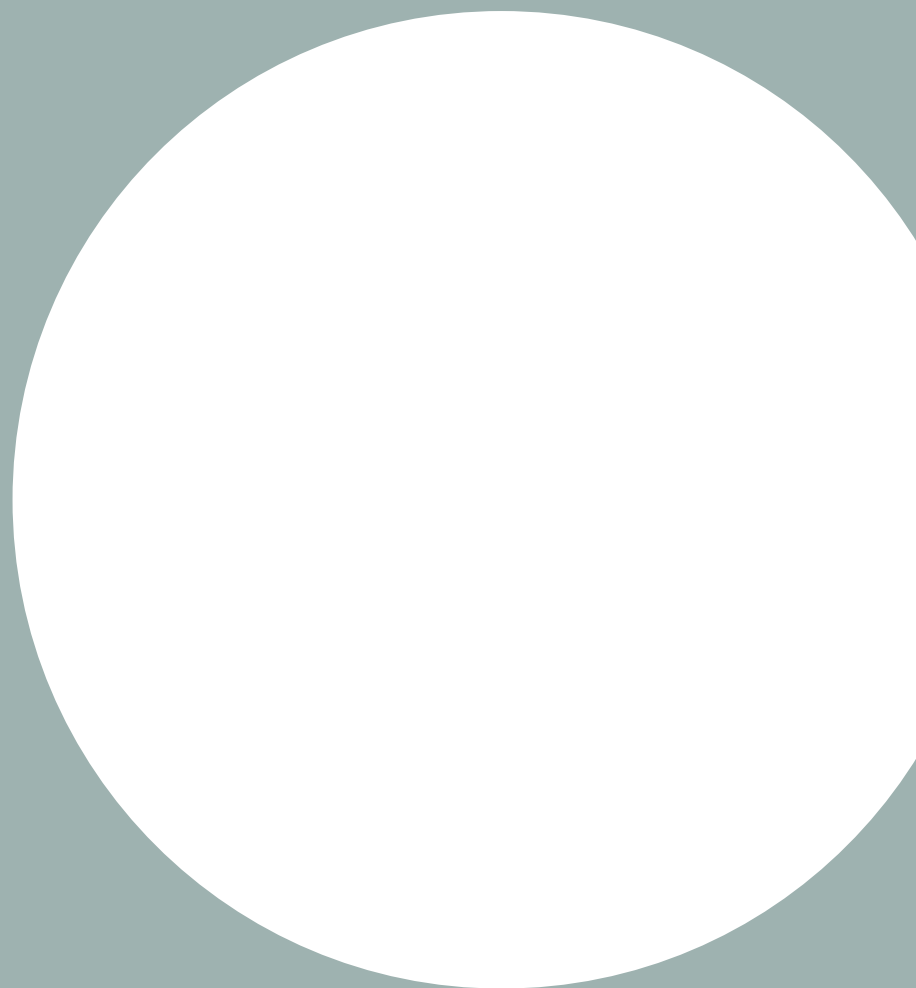
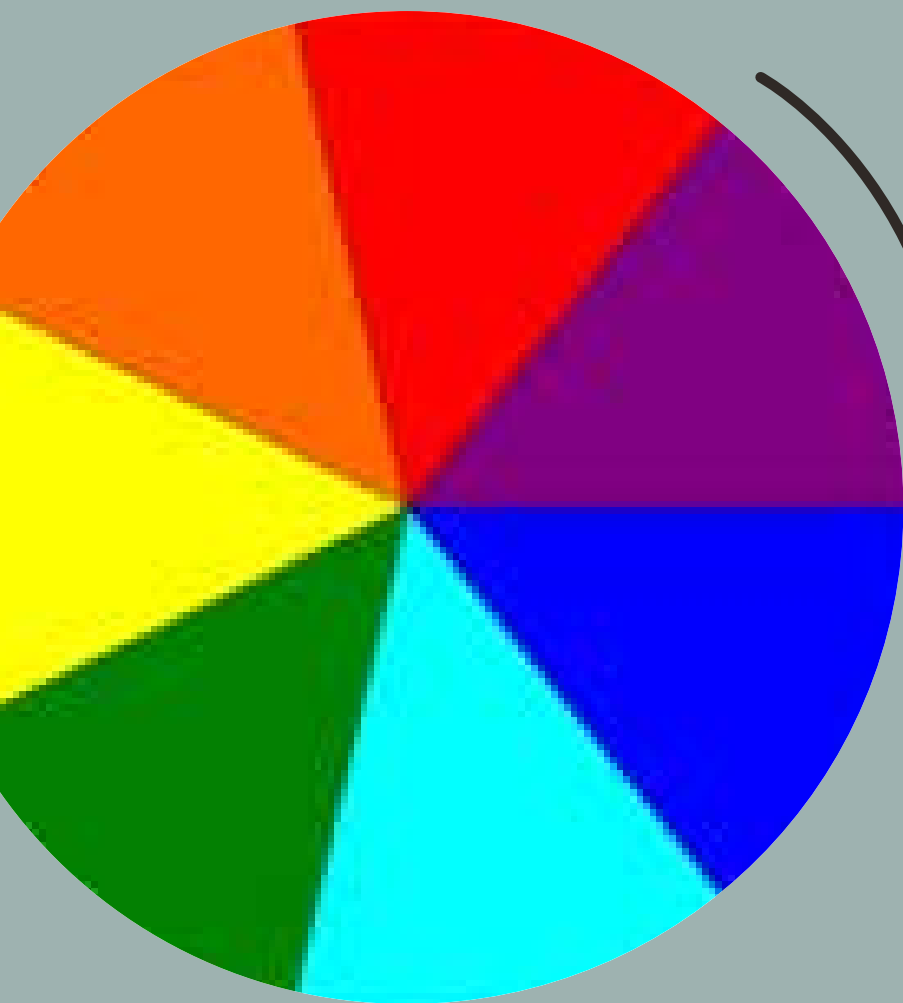
***SIDENOTE!***

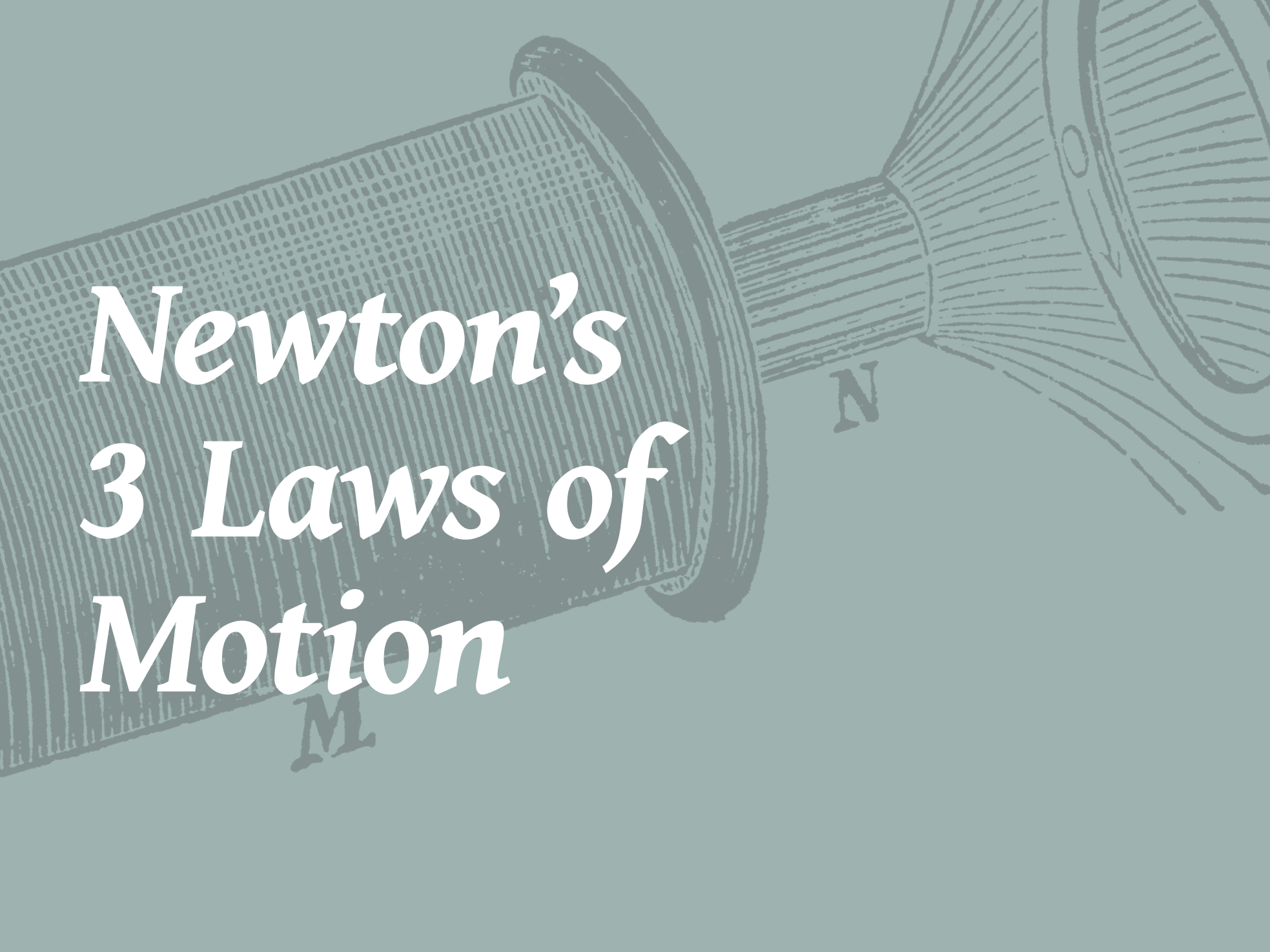
# Persistence of Vision





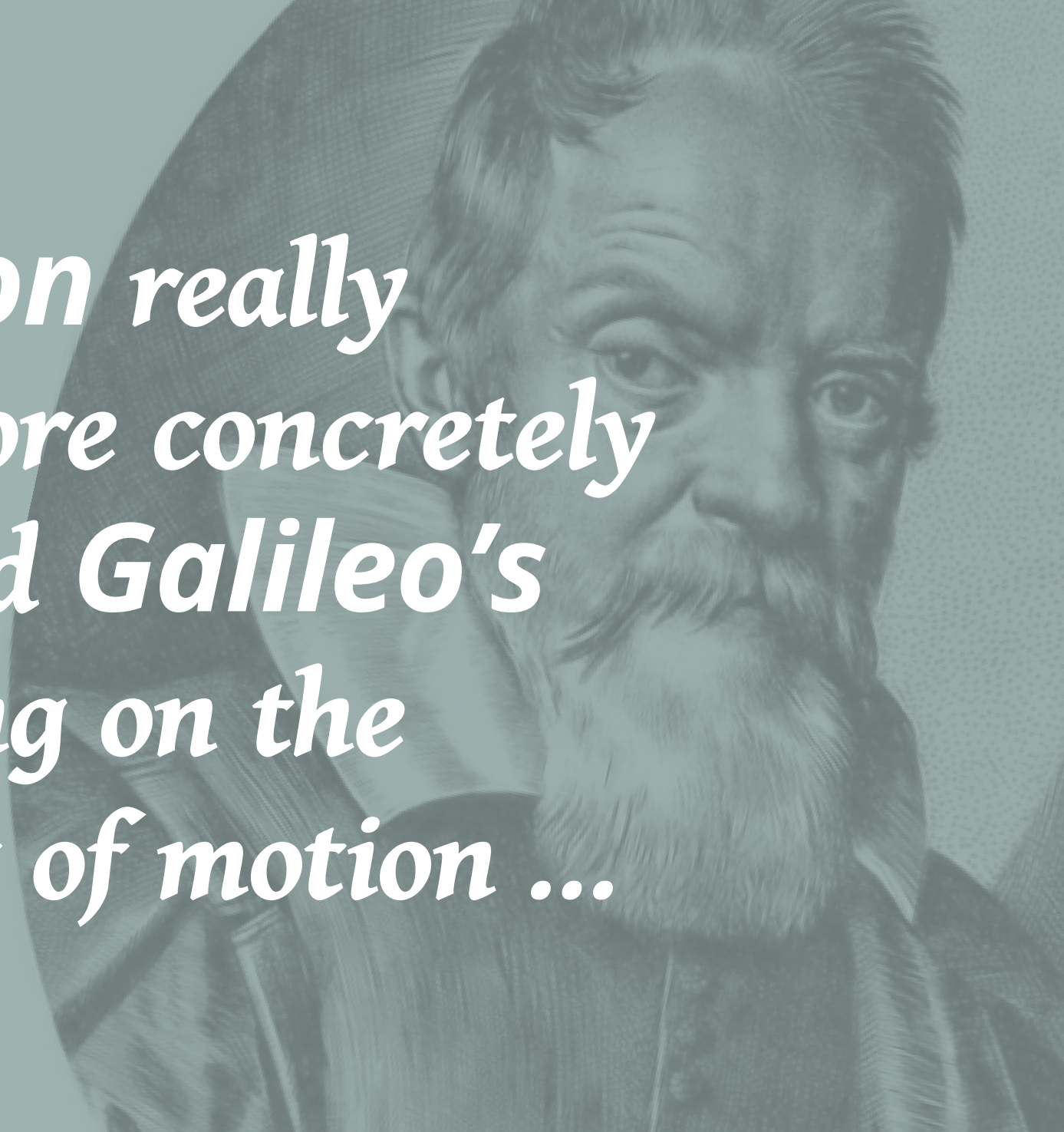


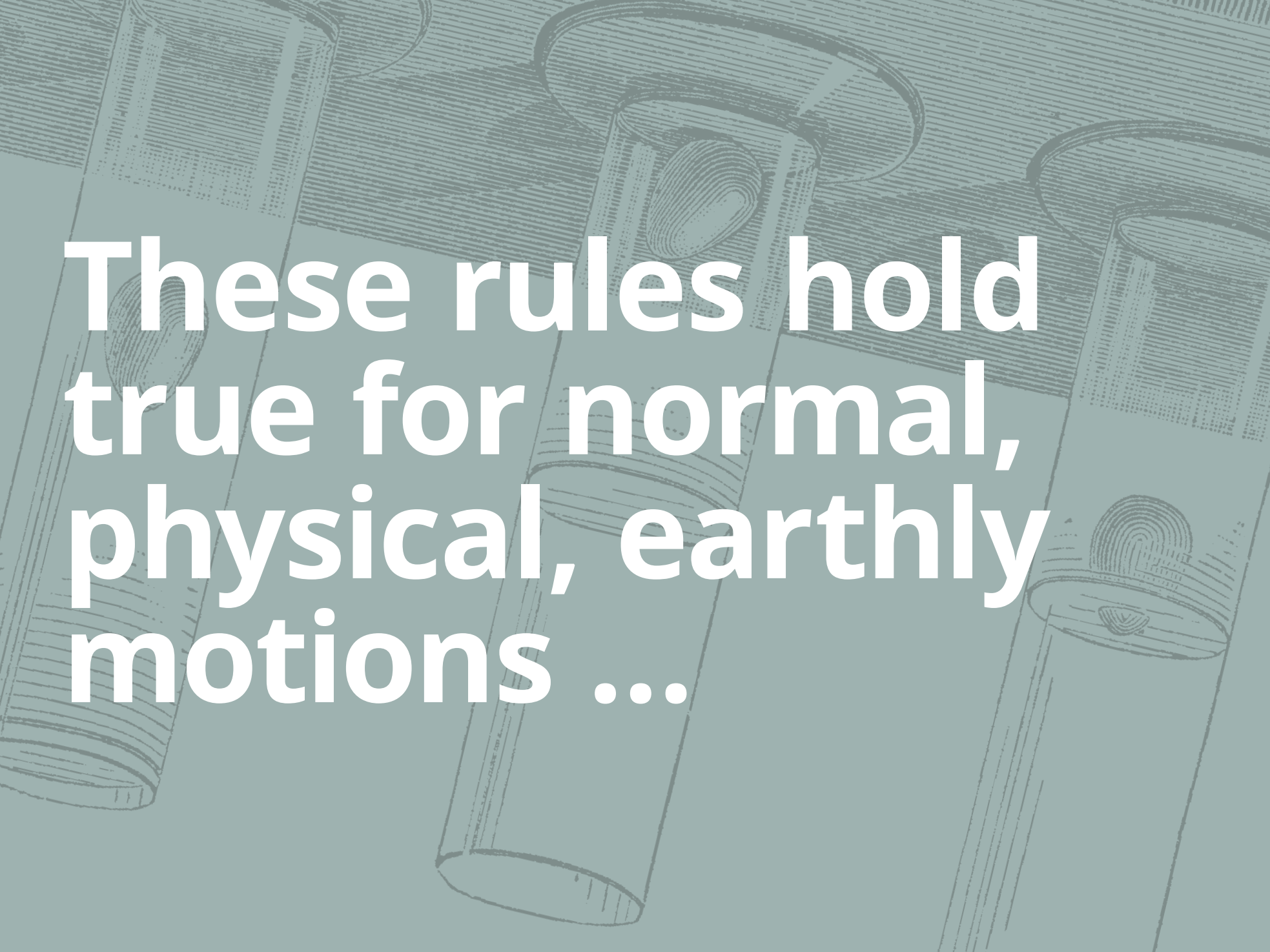




# *Newton's 3 Laws of Motion*

*Newton really  
just more concretely  
phrased Galileo's  
thinking on the  
subject of motion ...*



The background of the slide features a stylized, monochromatic illustration of three test tubes. Each test tube has a fingerprint on its upper portion. The test tubes are arranged diagonally across the frame, with the one on the left being the most prominent and the one on the right being the least. The illustration is rendered in a light blue or teal color against a darker, textured background.

**These rules hold  
true for normal,  
physical, earthly  
motions ...**





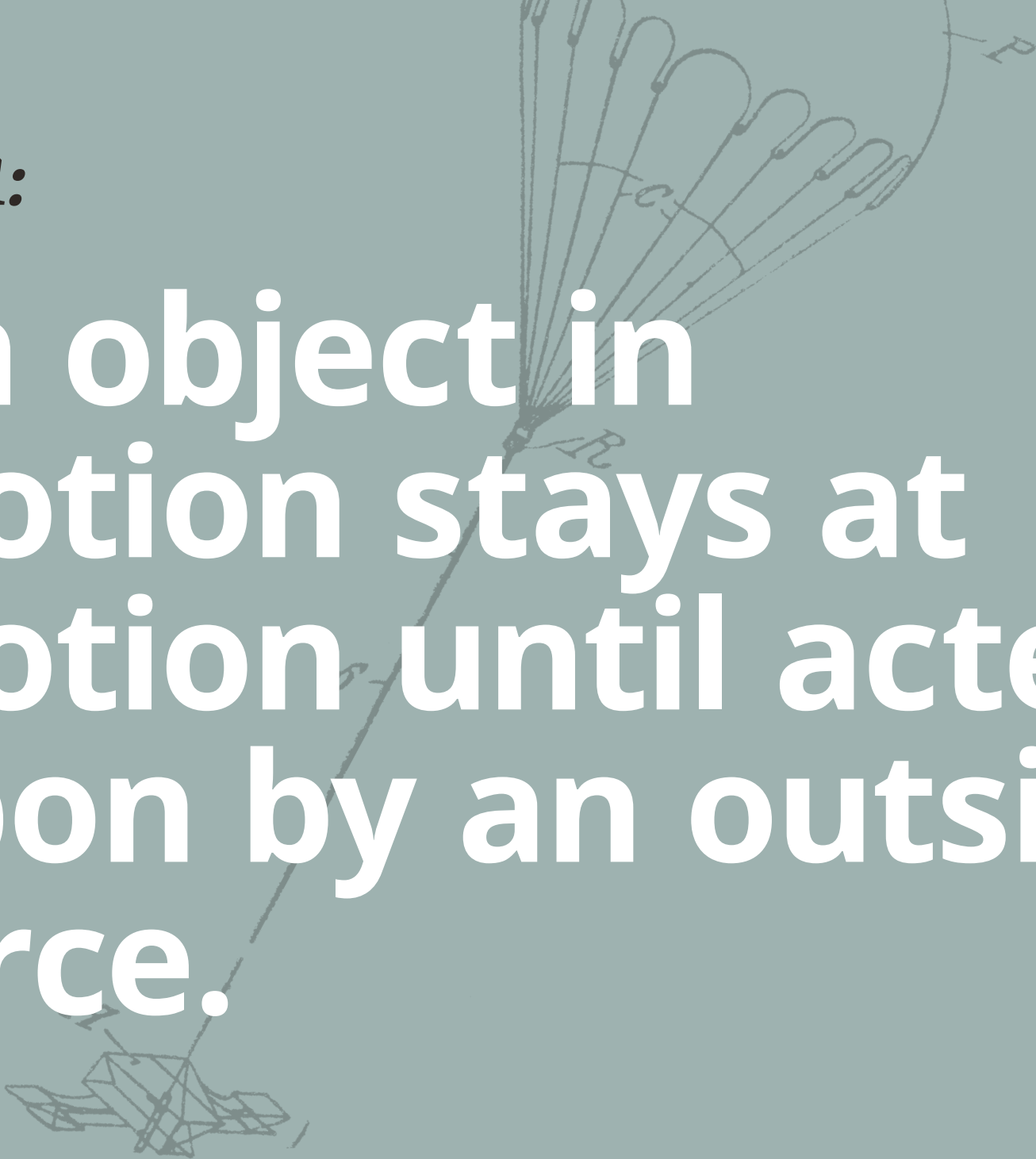






**LAW 1:**

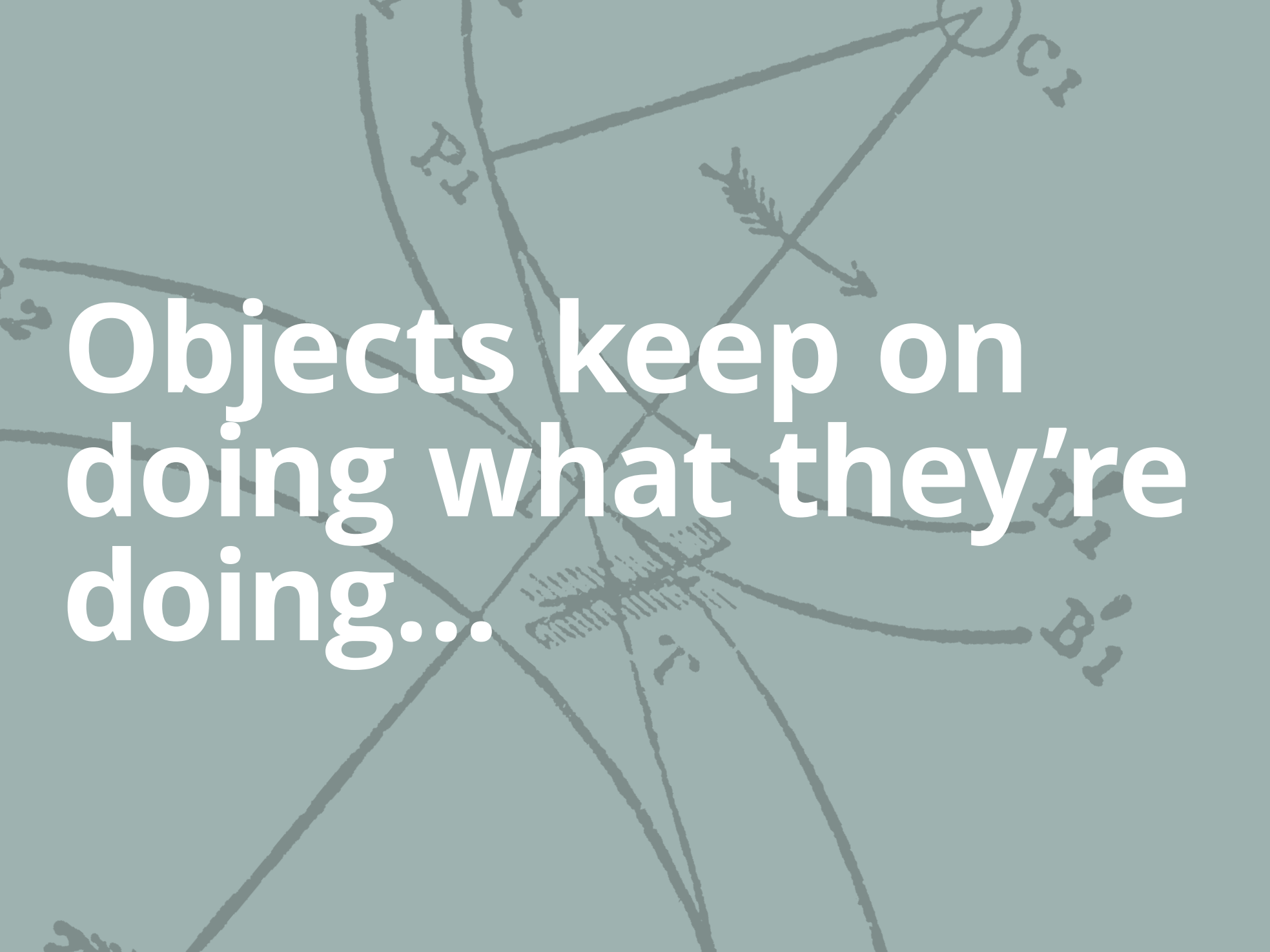
**An object in motion stays at motion until acted upon by an outside force.**





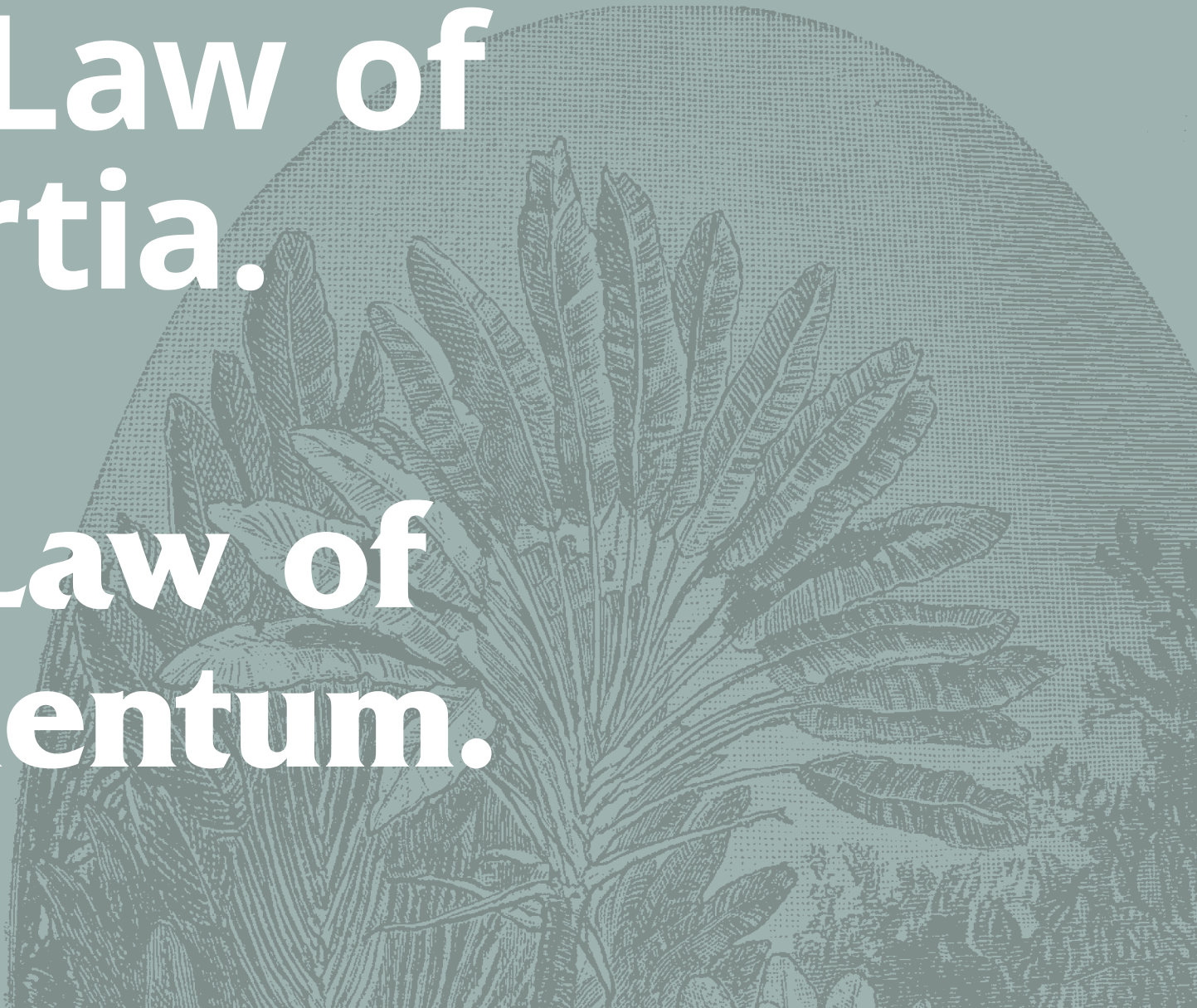
**Or; an object rest  
stays at rest until  
acted upon by an  
outside force.**





Objects keep on  
doing what they're  
doing...

**The Law of  
Inertia.**  
*or*  
**The Law of  
Momentum.**



A faint, stylized background illustration in a light gray tone. It depicts a coiled spring and a pendulum with a bob, suggesting concepts of motion and physics. The spring is coiled along a diagonal line, and the pendulum hangs from the top left, swinging towards the bottom right.

**Objects in *motion***  
**have *momentum***

**Objects at *rest***  
**have *inertia***







## ***LAW 2:***

The relationship between an object's mass ***m***, its acceleration ***a***, and the applied force ***F*** is  **$F = ma$** .

$$\mathbf{F} = \mathbf{ma}$$

F = force

m = mass

a = acceleration



**Heavier objects  
require more force  
to accelerate the  
same as lighter  
objects**

**Objects will  
move in the same  
direction as the  
force applied to  
them moves.**









***LAW 3:***

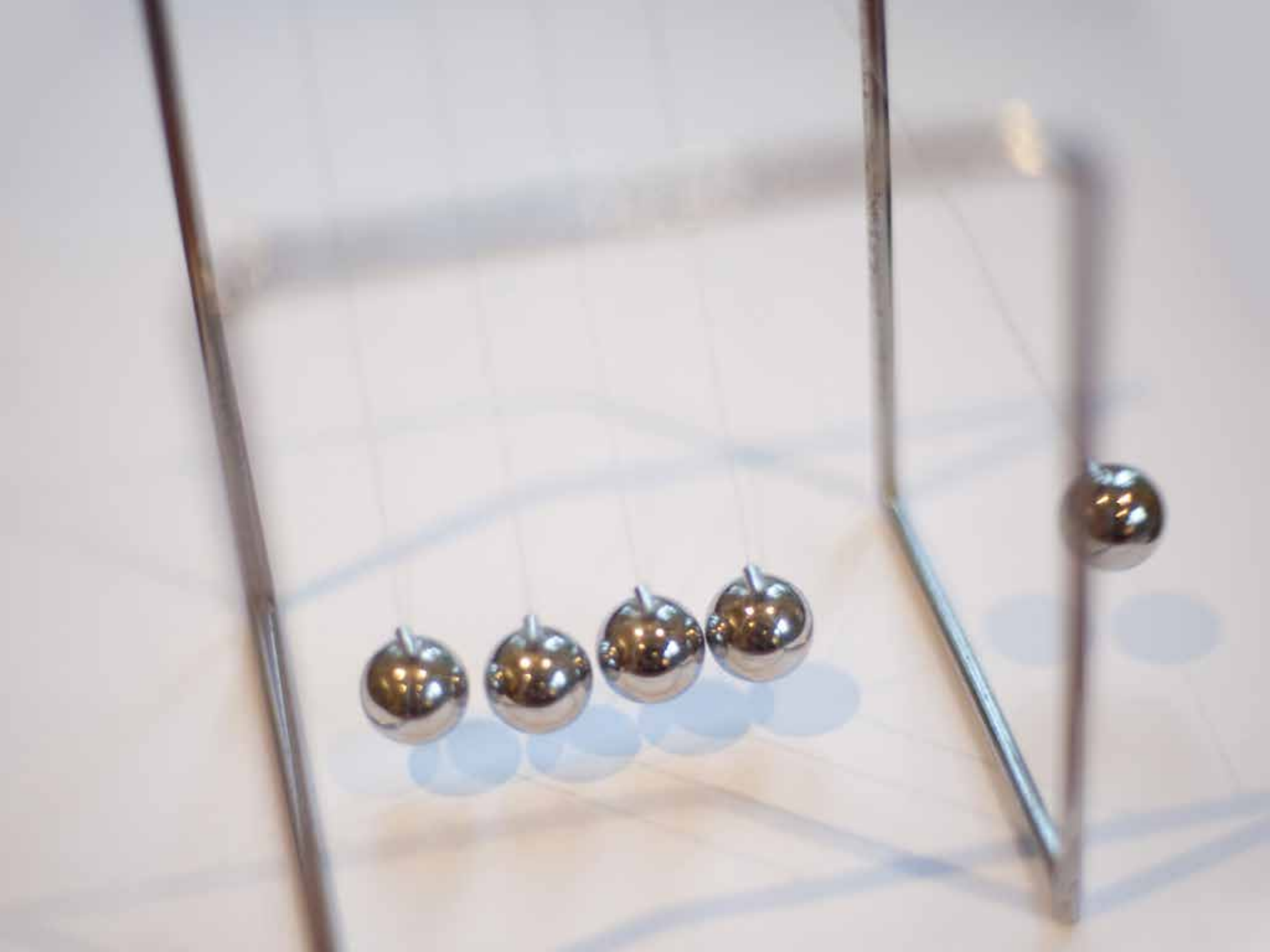
**For every action  
there is an equal  
and opposite  
reaction.**

**When you push an object it pushes back with equal force.**









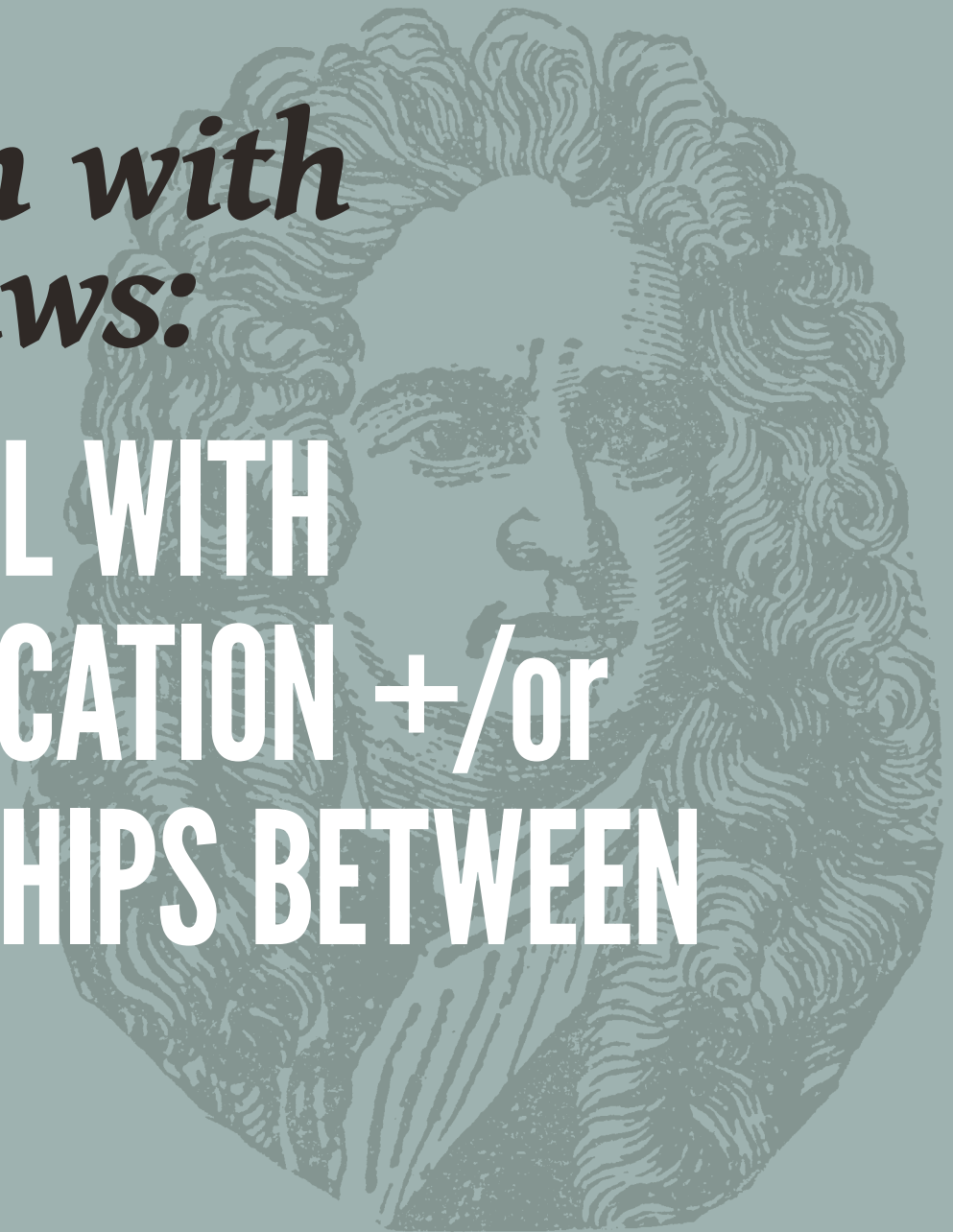
*Why You Should Care:*

**REALISTIC, (OR  
INTENTIONALLY UNREALISTIC)  
REPRESENTATION OF  
MOTIONS...**

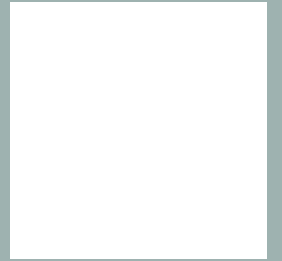
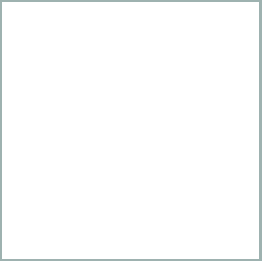


*The problem with  
Newton's Laws:*

**THEY ONLY DEAL WITH  
CHANGES IN LOCATION +/-or  
THE RELATIONSHIPS BETWEEN  
OBJECTS ...**



Newton gives us  
**CHANGE IN POSITION**







**DEFINITION:**

**Motion:**  
*a change in place or  
location over time ...*

\* This is technically “velocity” in physics

*does anybody have any*

**QUESTIONS?**



A grayscale illustration of a hand holding a pencil, sketching a rectangular object with a textured surface. The hand is positioned diagonally across the frame, with the pencil tip touching the object. The background is a solid dark gray.

*for ideas more relevant*

**TO DESIGN,**

*we need to go a little  
farther back ...*

# ARISTOTLE

*384 BC – 322 BC*

*Aristotle used the term*

**“MOTION”**

*to describe any kind of*

**CHANGE**





**DEFINITION:**


**Motion:**  
*any change over time.*

- 
1. *Local Motion*
  2. *Alteration*
  3. *Growth*
  4. *Coming to be & Passing Away*



**ARTIFICIAL**  
*caused by man*

VS



**NATURAL**  
*caused by nature*

The background of the slide is a solid dark gray. Overlaid on this background are several faint, light gray geometric patterns. These include several concentric circles of varying sizes, some of which are centered on the slide, and several interlocking gears of different sizes, some of which are also centered. The patterns are semi-transparent and serve as a decorative backdrop for the text.

*artificial motions are aka*

# **VIOLENT MOTIONS**

*violent in that they violate natural  
tendencies of objects*

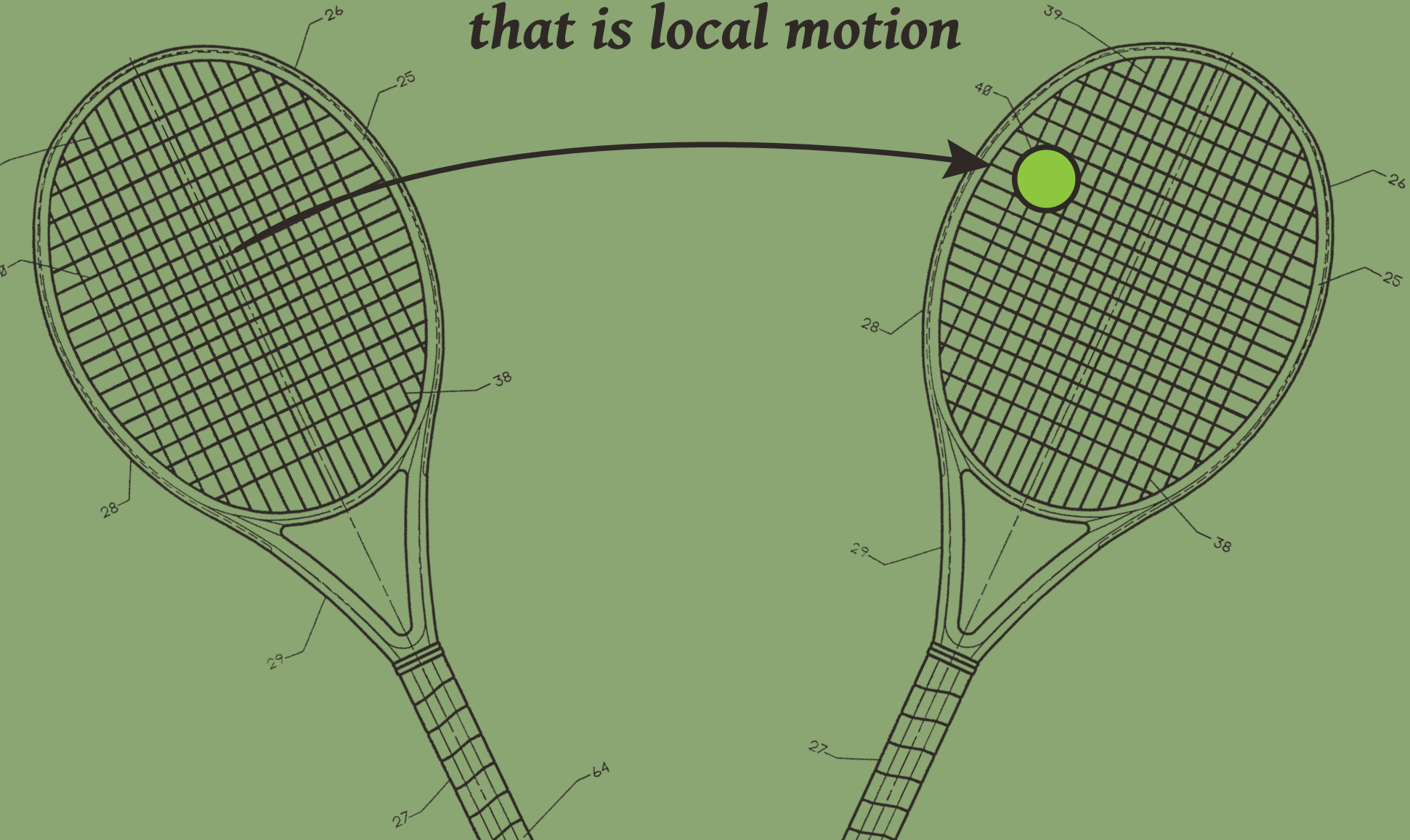


# 1. LOCAL MOTION

*a change in place*



*the moving thing is the  
unchanging subject of the change  
that is local motion*



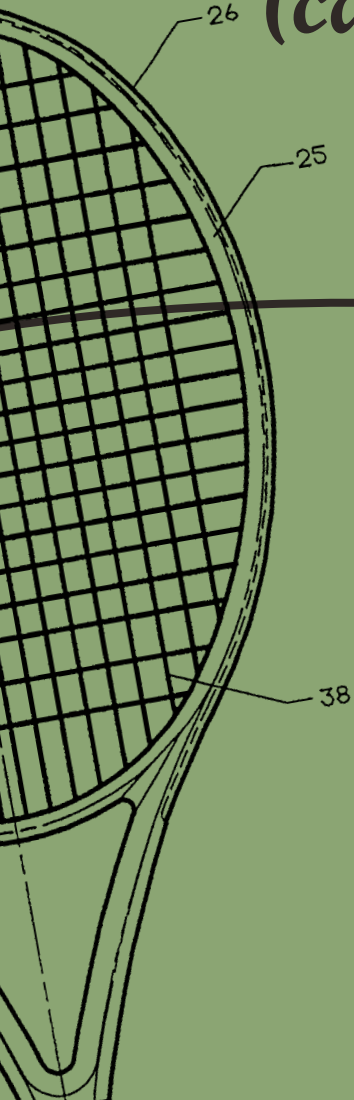
# ARTIFICIAL

VS.

# NATURAL

*(caused by man)*

*(caused by nature)*

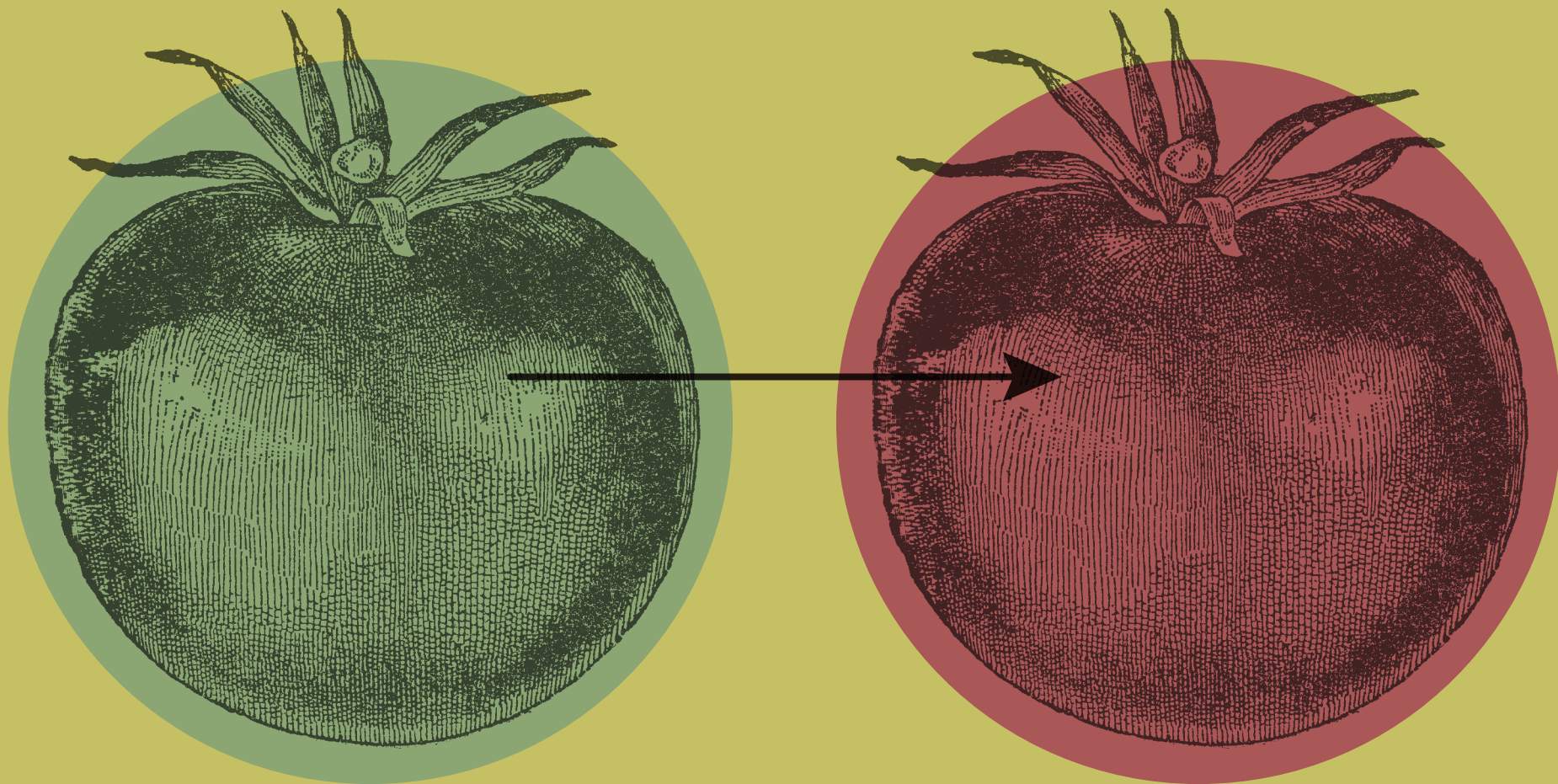


*hitting vs. dropping*

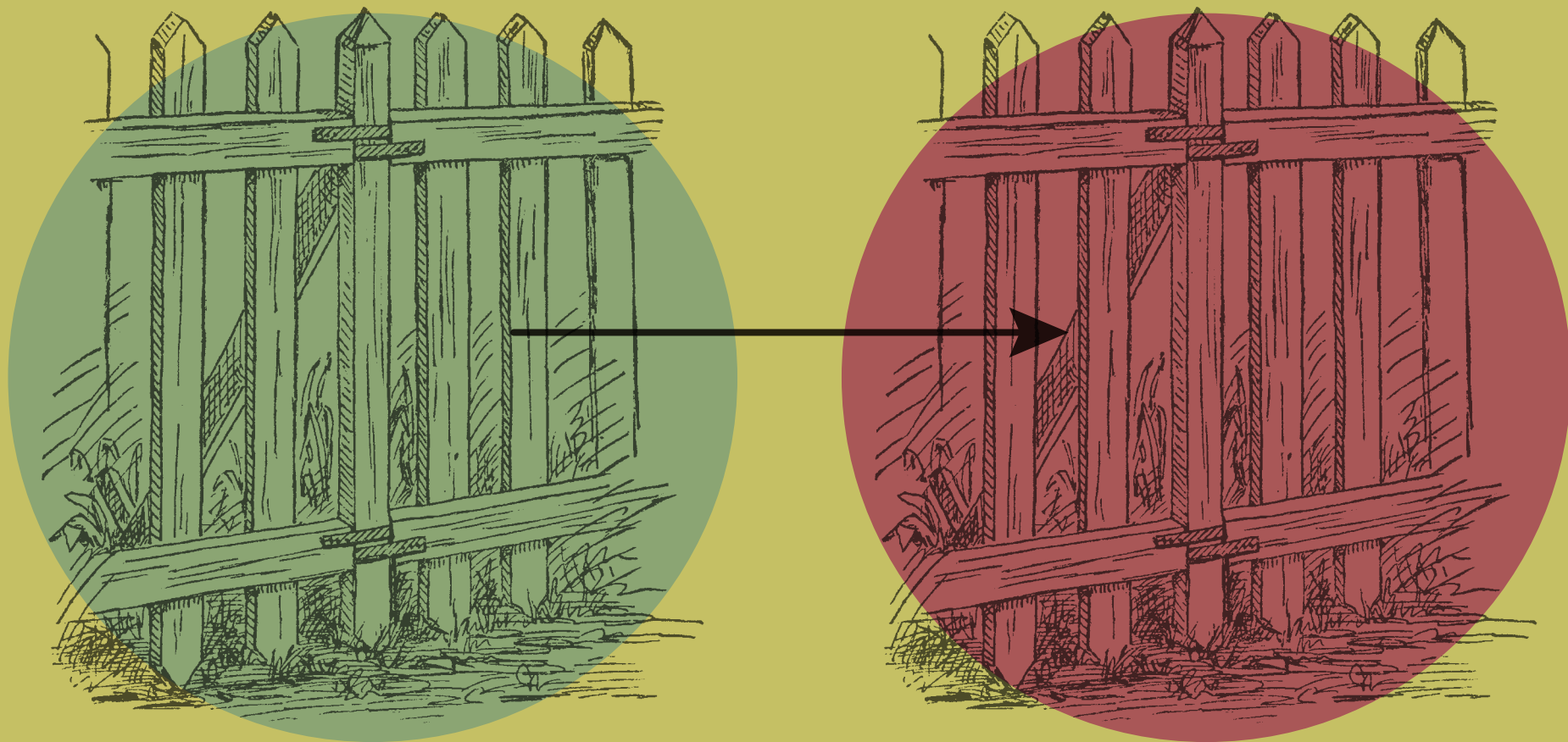
# 2. ALTERATION

*alterations of attributes;  
a change in quality*

***natural***



# *artificial*

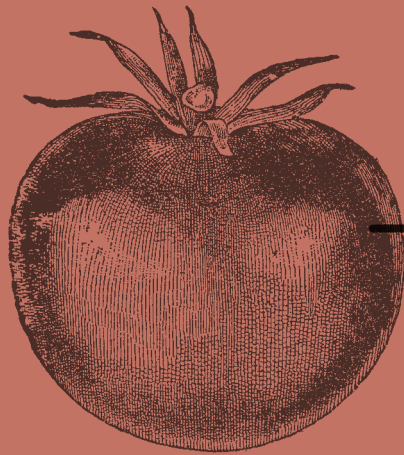




# 3. GROWTH

*a change in quantity*

*natural*



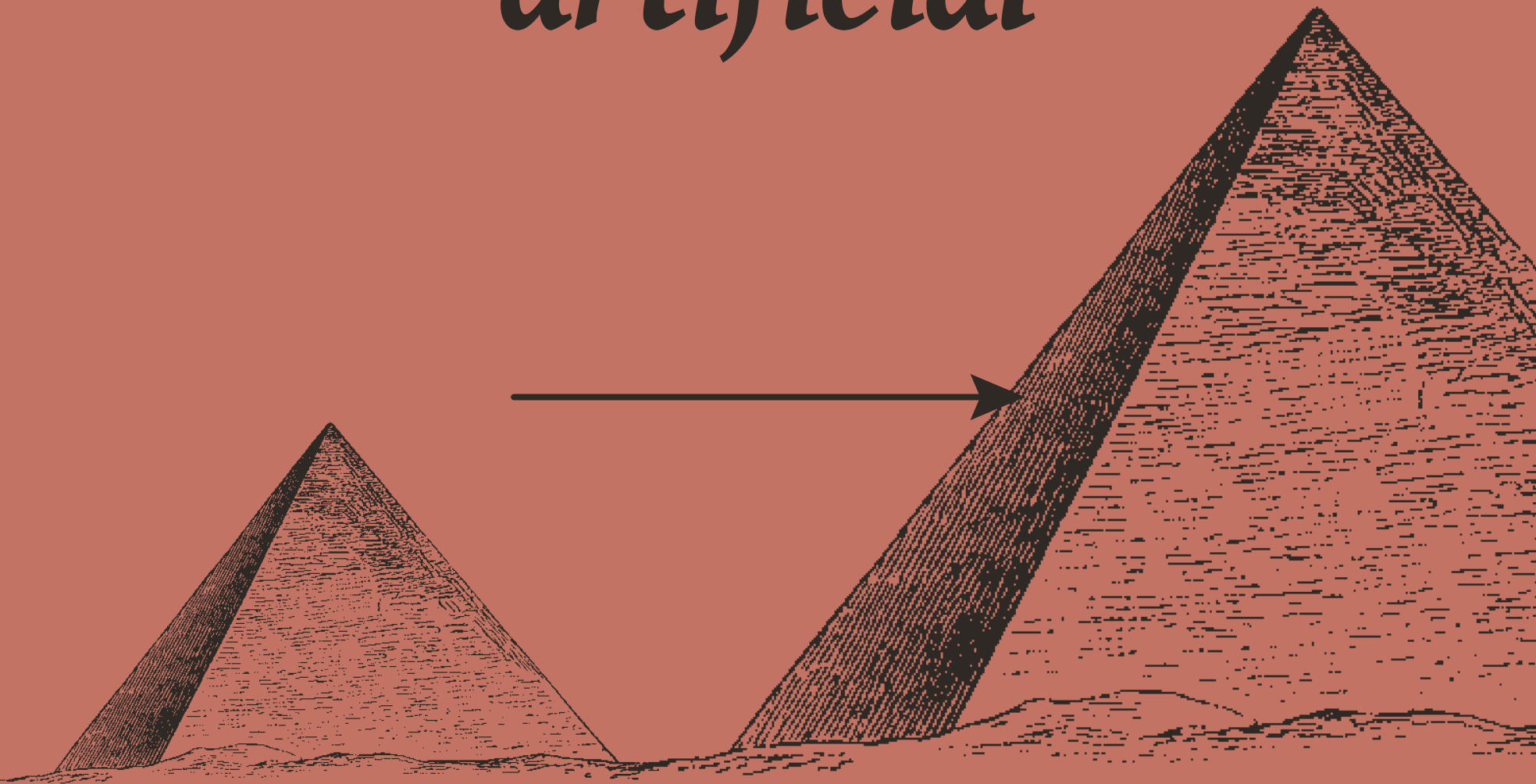
*natural*



***natural***



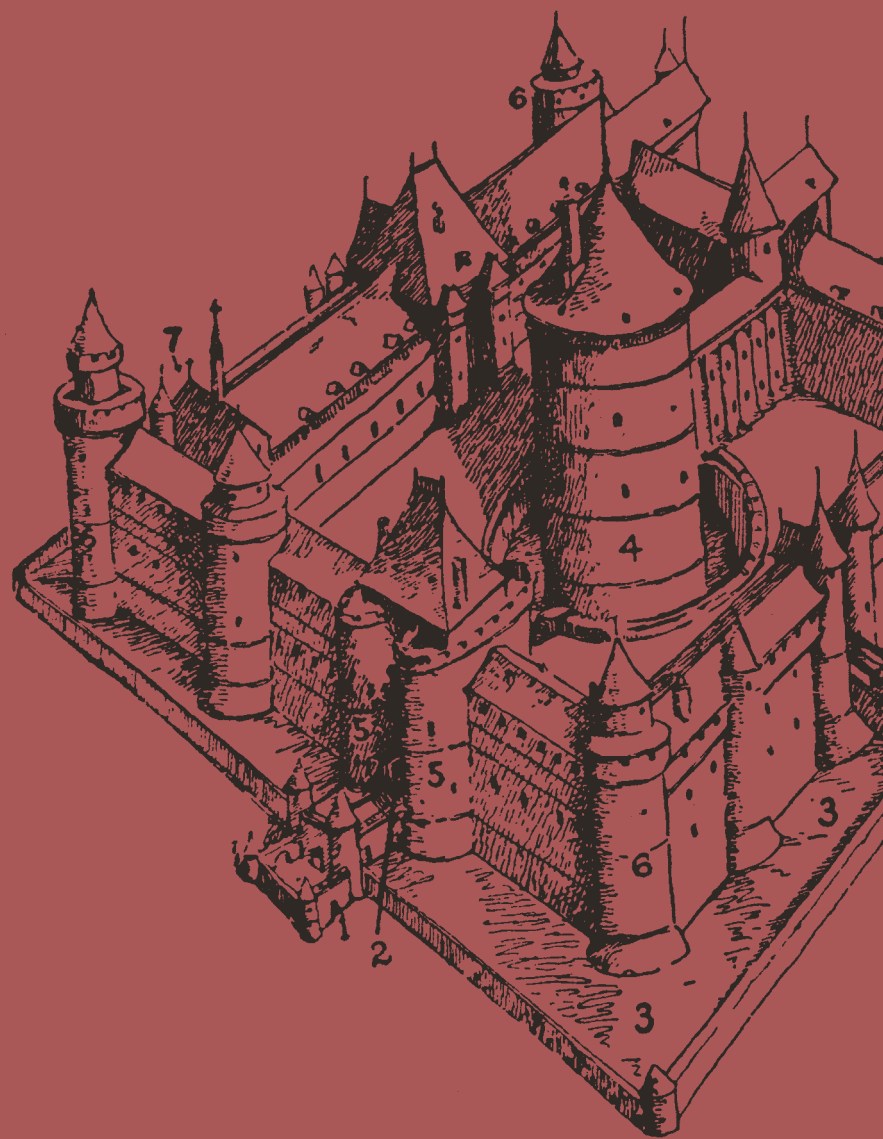
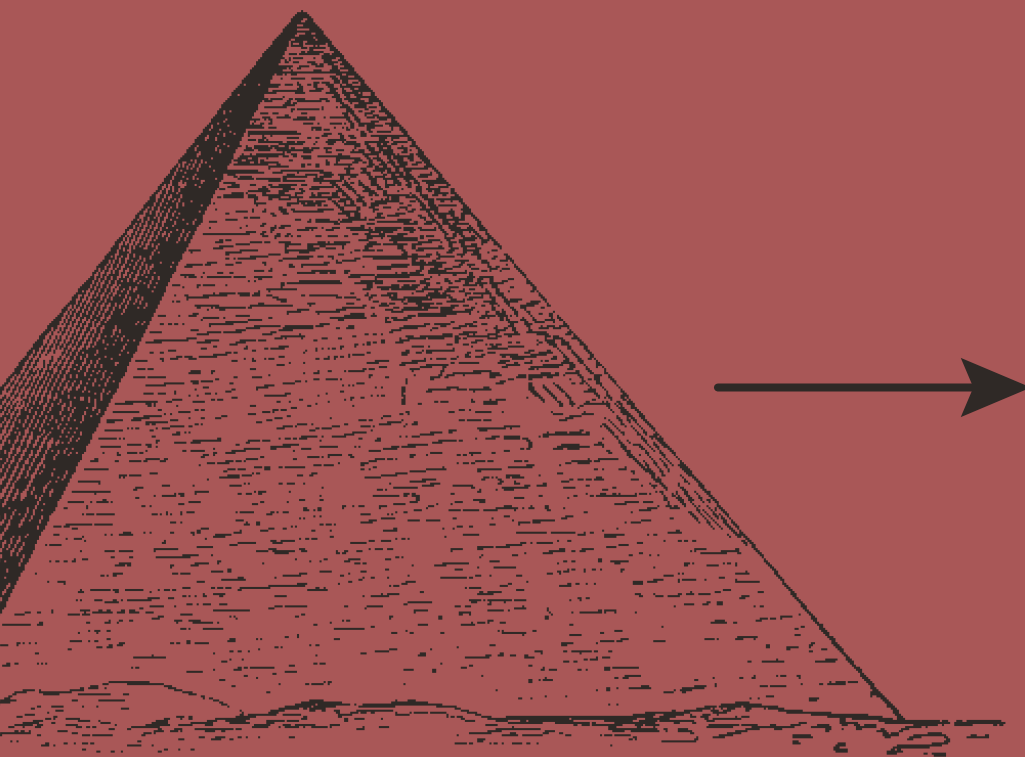
*artificial*



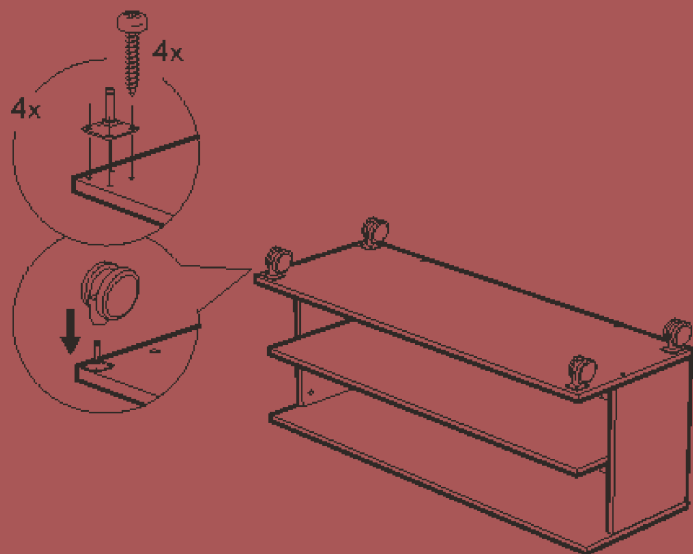


# **4. COMING TO BE & PASSING AWAY**

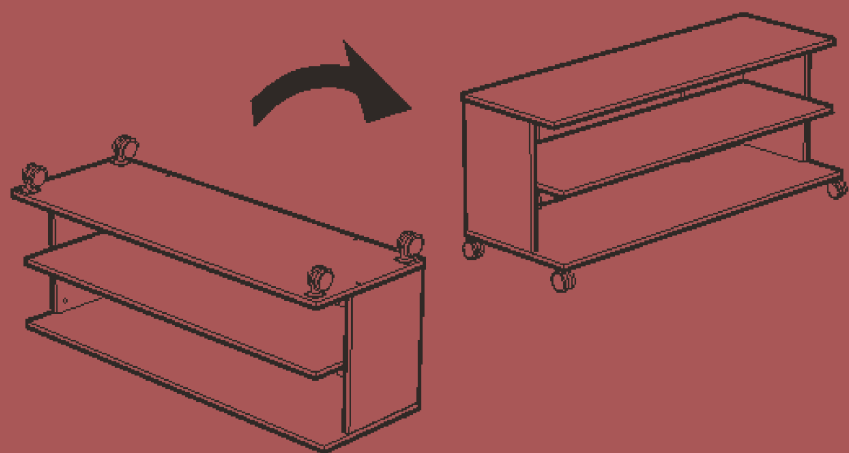
*a change in substance*



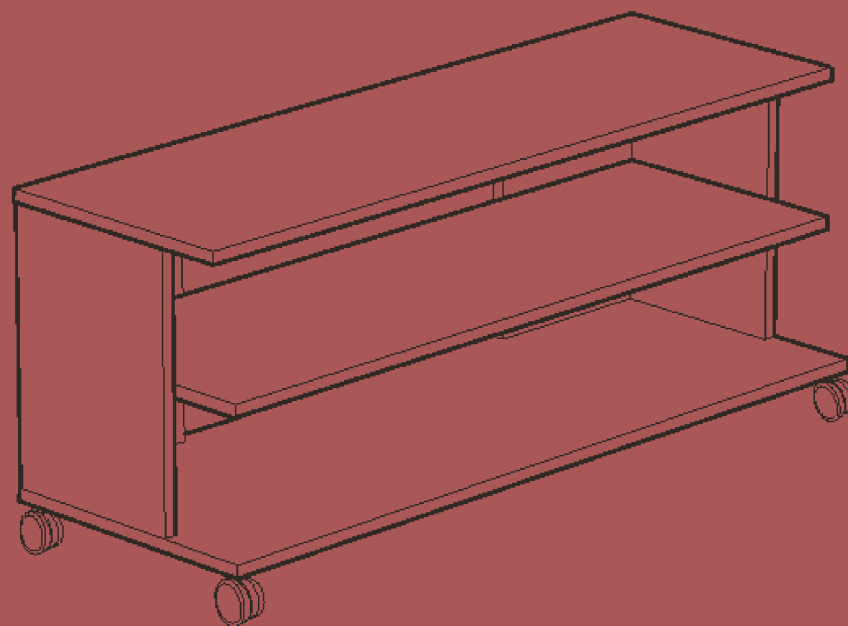
10

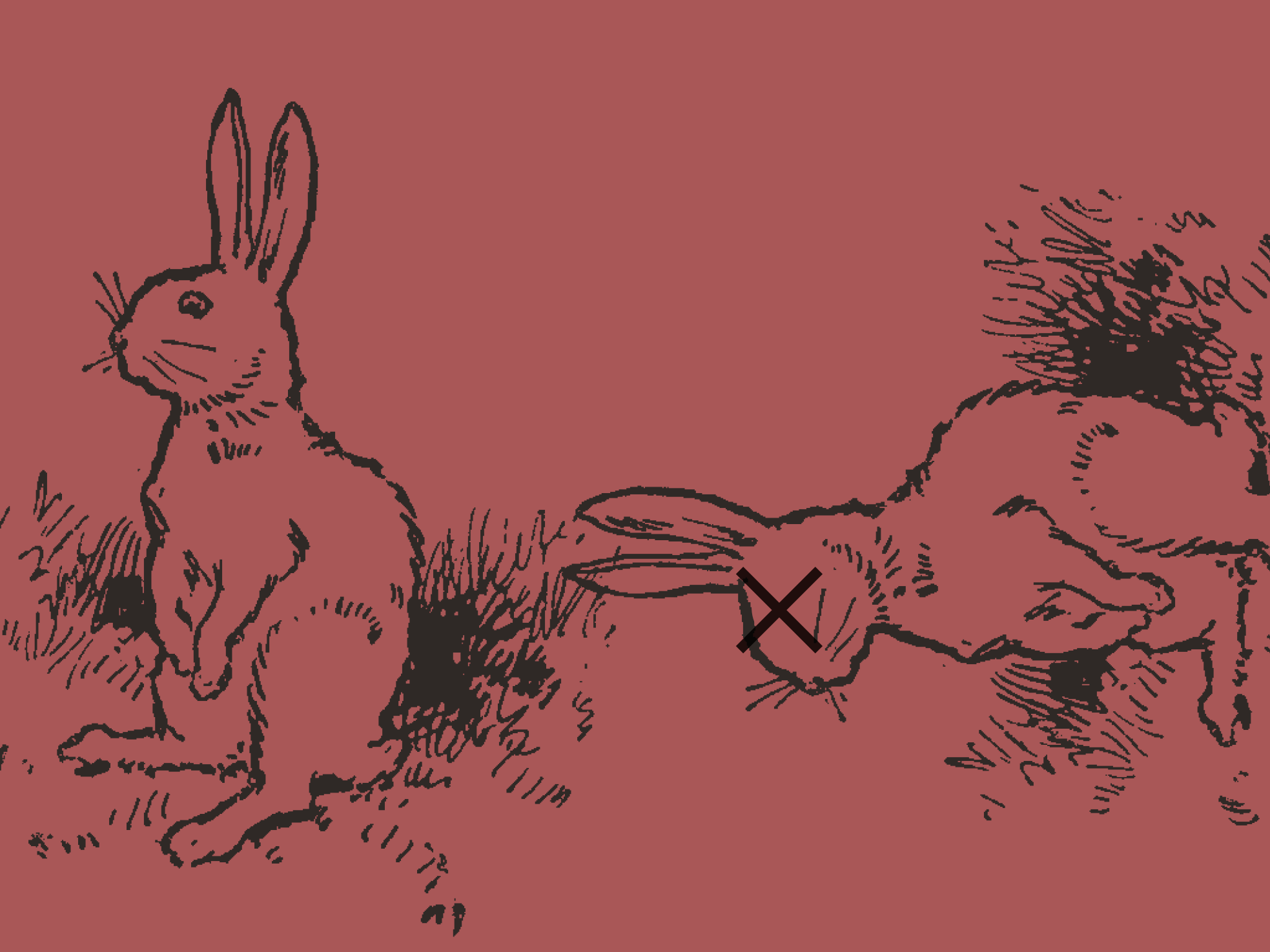


11



# BENNO





*now is the time for*

QUESTIONS





SO!

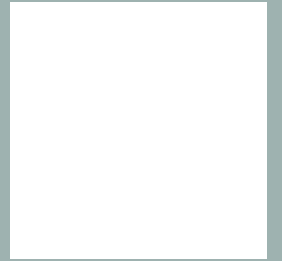
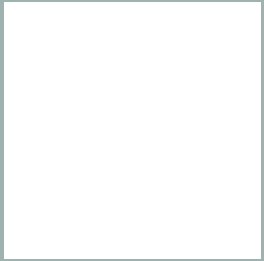
*what does this have to*

*do with* DESIGN?

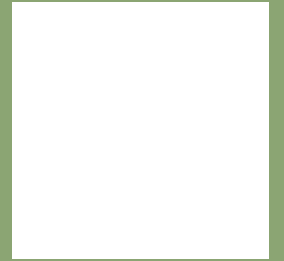
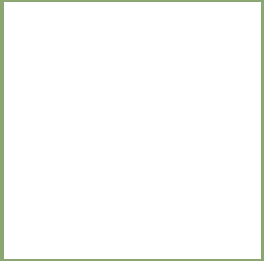
# Basic forms of Motion ...



Newton gives us  
**CHANGE IN POSITION**



Aristotle confirms  
**CHANGE IN POSITION**  
With his type of change:  
**LOCAL MOTION**



Aristotle then adds

**CHANGE IN QUALITY**

**CHANGE IN QUANTITY**

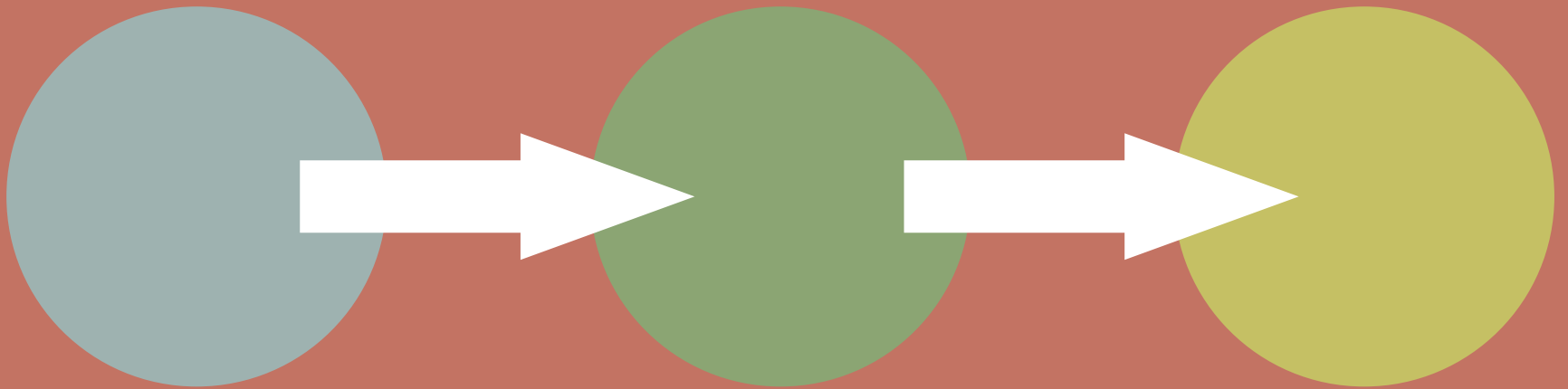
and

**CHANGE IN**

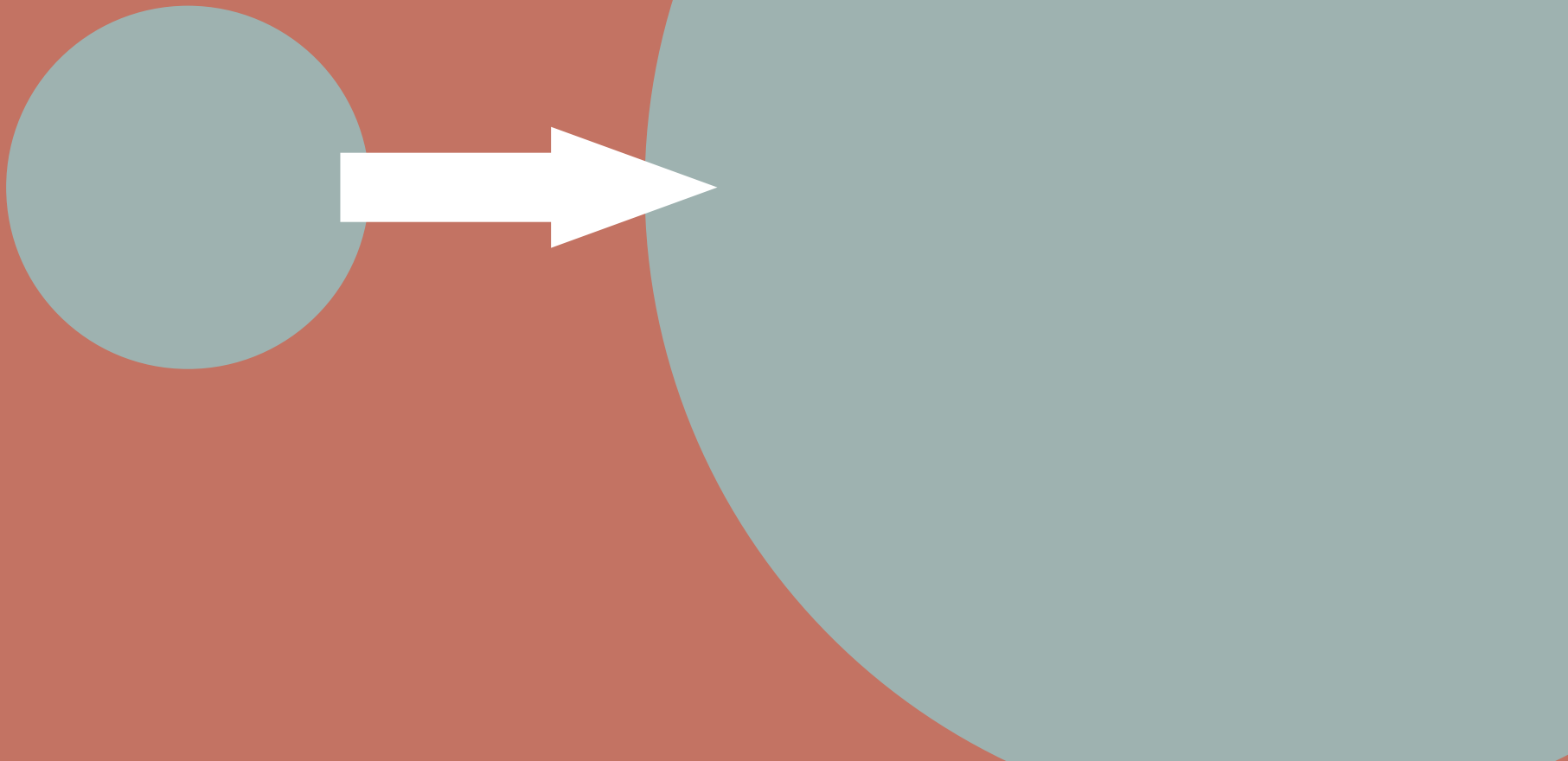
**SUBSTANCE**



# CHANGE IN COLOR



# CHANGE IN SCALE



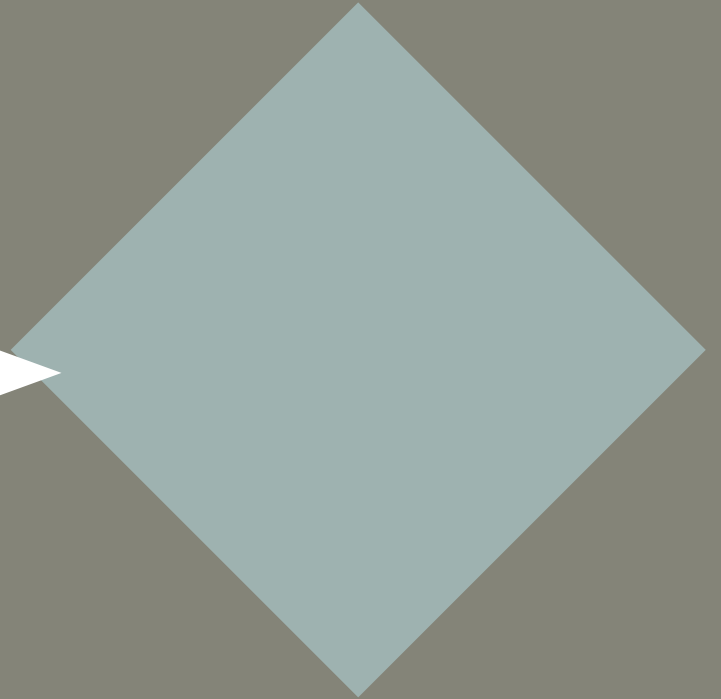
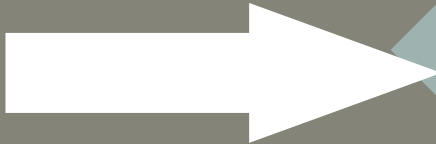
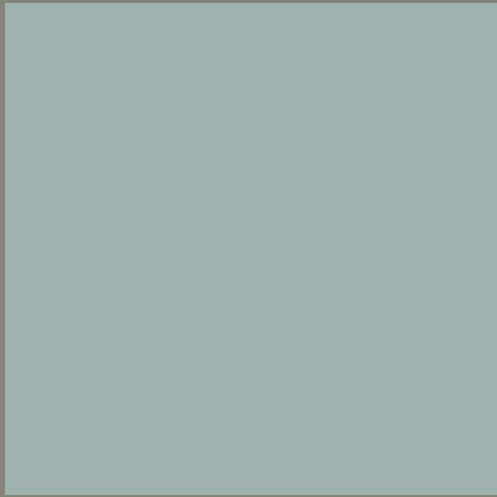
# CHANGE IN SHAPE



so there's that...  
and, we can actually  
add a few more

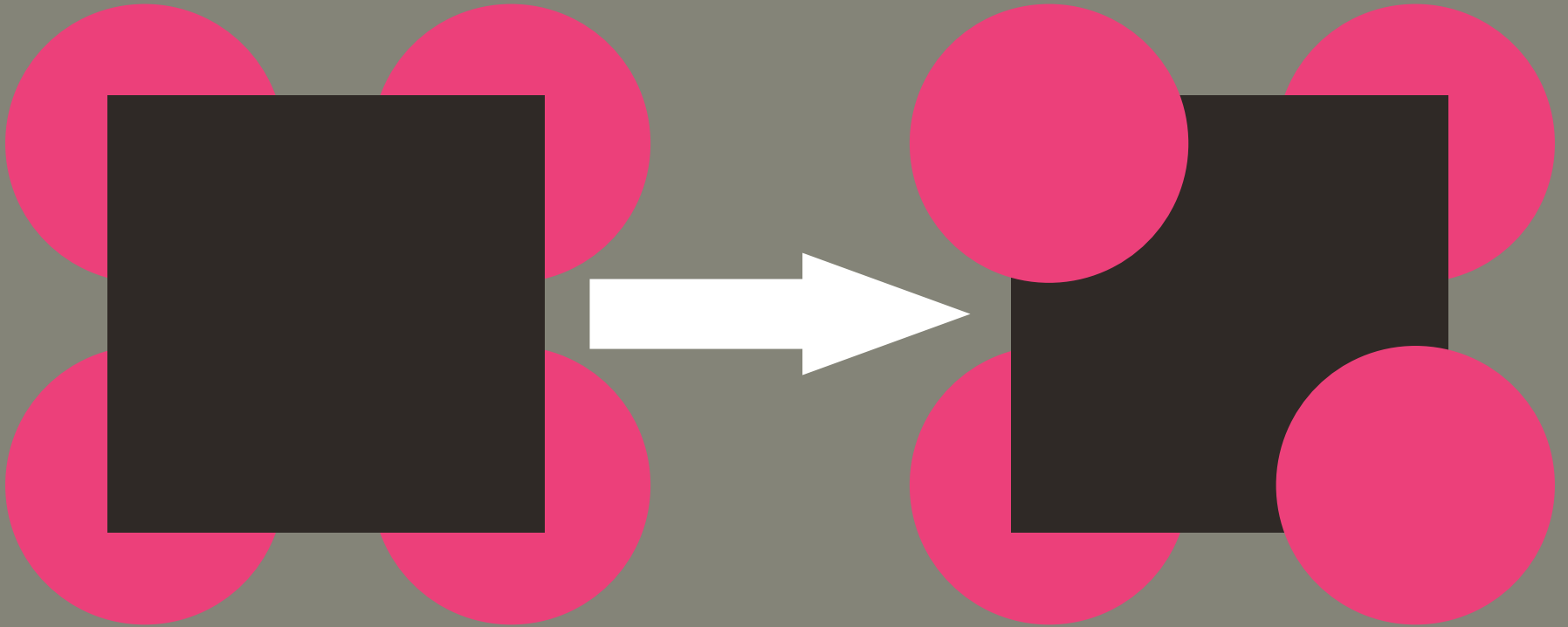
**LIKE:**

# CHANGE IN ROTATION

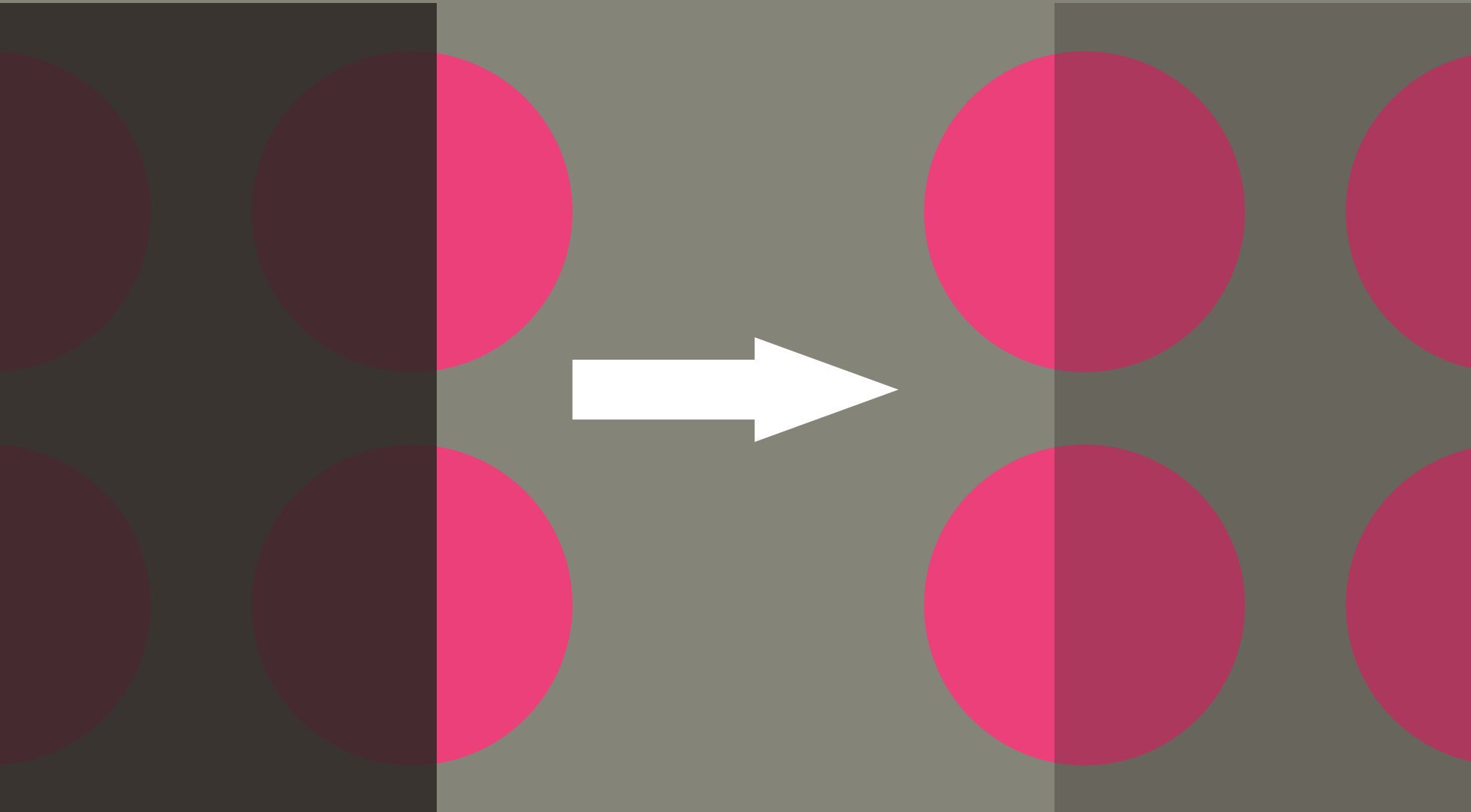




# CHANGE IN DEPTH



# CHANGE IN TRANSPARENCY



# **BASIC FORMS OF MOTION ...**

- 1. Change Position**
- 2. Change Color**
- 3. Change Scale**
- 4. Change Shape**
- 5. Change Rotation**
- 6. Change Depth**
- 7. Change Transparency**

*are there any*

QUESTIONS?

