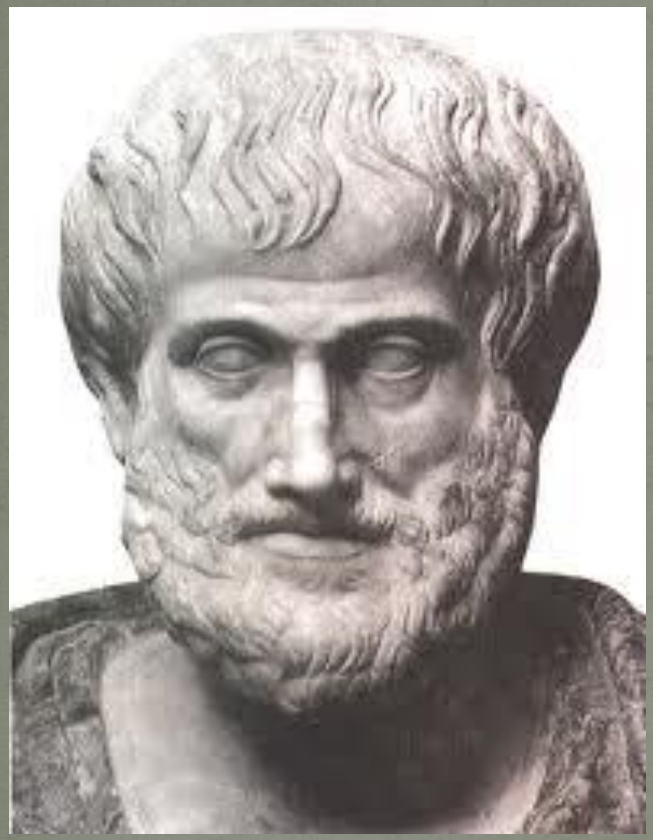
Inertia

Aristotle



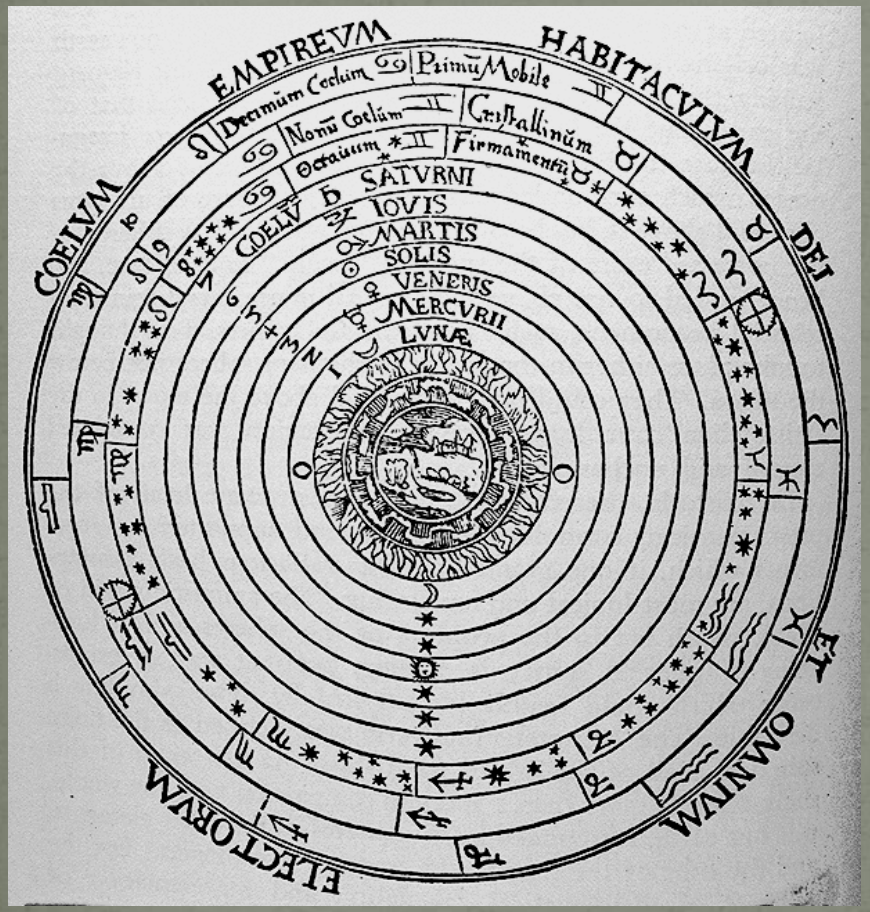
- Natural motion: How does something move if there are no forces acting on it?
- Aristotle asked this question more than 2500 years ago.

Aristotle's answer…

celestial

terrestrial

Celestial motion

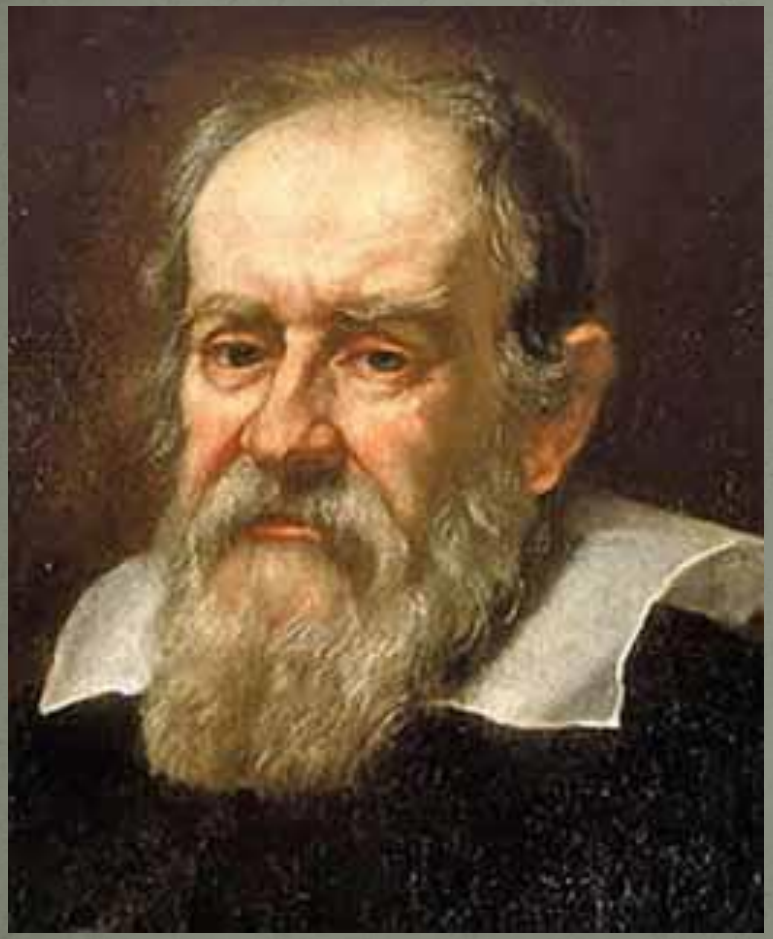


- Stars and planets move in perfect circles with constant velocity

Terrestrial motion

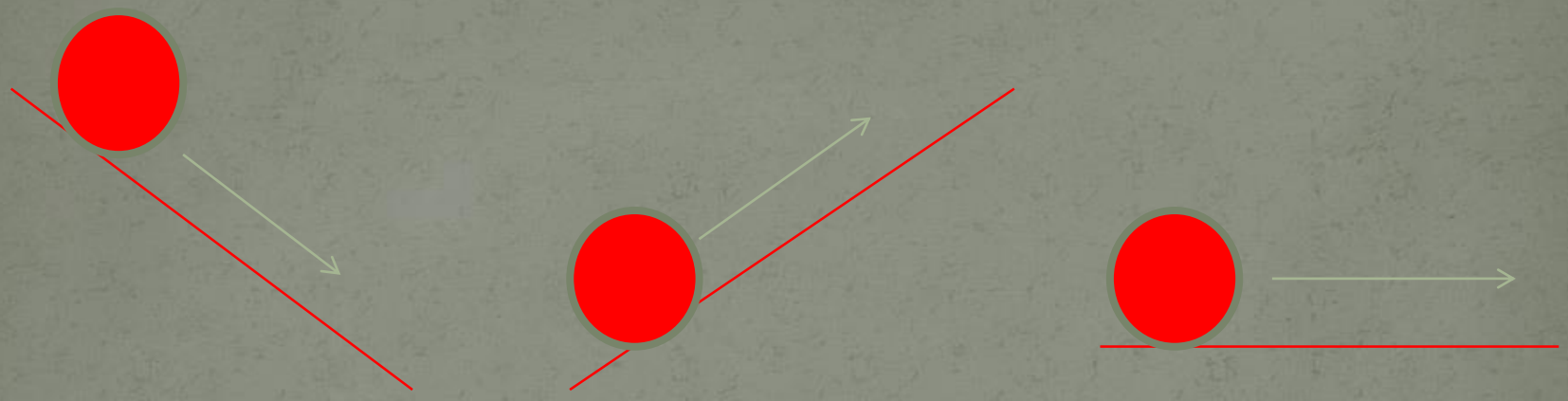
- Objects on Earth tend to move to the center of the Earth (believed to be center of universe at the time) – natural motion
- Any other motion (sideways) was only possible with a force – violent motion. Example, pushing a book along a table

Galileo



- Galileo thought the book stopped for another reason – friction.
- Introducing the idea of friction allowed him to consider what might happen if friction were removed
- Galileo experimented in this ‘frictionless world’ using thought experiments.

Thought Experiment #1



- Ball speeds up Ball slows down Speed is constant

Thought Experiment #2

- A ball released on an incline will rise to the same height rolling up an incline

Thought Experiment #2

- This is true even if the angle of the incline is decreased. The ball will continue until it ‘finds’ that same height.

Thought Experiment #2

- If the angle is decreased to zero (horizontal), the ball will continue forever, ‘seeking’ the height from which it was dropped.

Try it!!!

- Recreate Galileo's experiment using a toy car and track.
- As the angle decreases, what happens to the distance the car travels up the ramp?
- If the angle is zero, how far would you expect the car to go?

Galileo

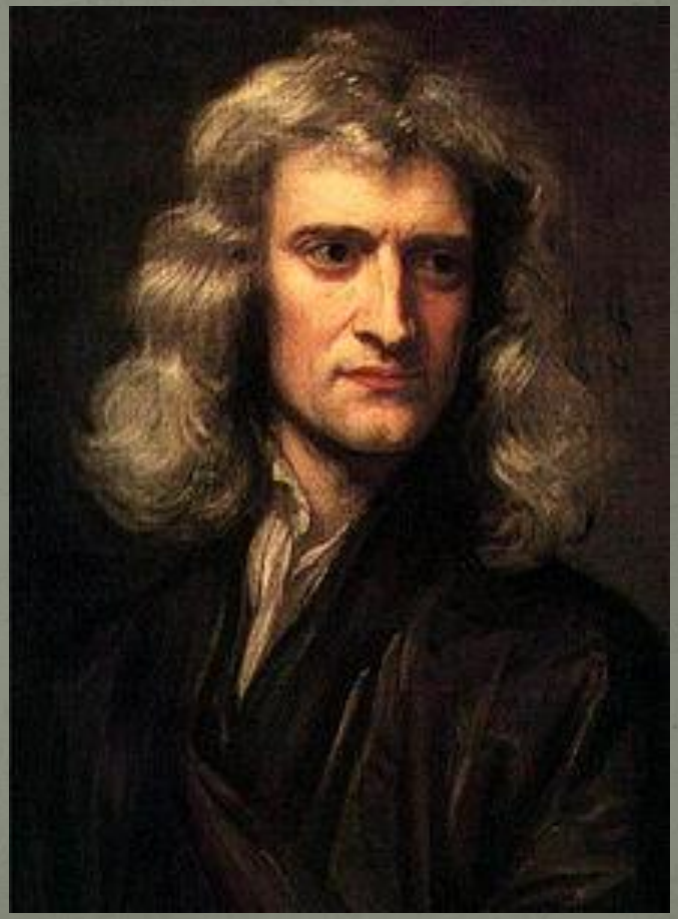
- Galileo introduced the idea of friction, BUT
- Because he knew the Earth was round, and 'ideally' a dropped ball would continue rolling until it finds the height from which it was dropped, it would continue all the way around the Earth – a circle.
- Galileo maintained that natural motion is circular

Descartes

- Rene Descartes modified Galileo's idea of natural motion, stating that it was really in a straight line.

The Famous Newton

- Newton formalized this idea and published it in ***Principia***
- The property of an object to resist changes in it's motion is called inertia
- An object in motion will stay in motion and an object at rest will stay at rest unless acted on by an external force.



Inertia

- Remember, inertia is a property of ***mass***.
- It is harder to move a semi-truck than a car, or slow it down when it is moving – BECAUSE OF INERTIA!!!

Mass vs Weight

Mass is the amount of matter in an object, and is the same everywhere (even in the absence of gravity)

Weight is the force of gravity on an object, so it depends on the gravity present.

Even an object in space has intertia!!!

Biggest Lie in Physics…

- Centrifugal Force – no such thing!!!
- When you turn a corner in a car, your body gets pressed against the side because it wants to continue in a straight line due to your inertia, **not** a force pushing you out.