

# BELL WORK

What is a revolution?

Name some revolutions that have occurred in history.

How does science contradict religious teachings?

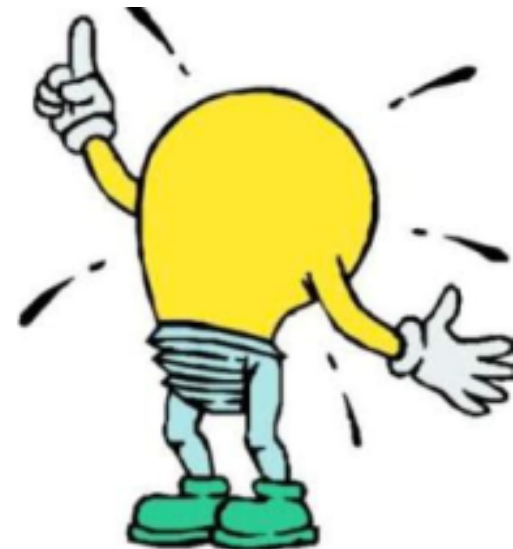
# Objective

- I can evaluate how the scientific revolution affected society.
- 7.60 Gather relevant information from multiple print and digital sources explaining the significance of new scientific theories, the accomplishments of leading figures including Sir Frances Bacon, Nicolaus Copernicus, Rene Descartes, Galileo Galilee, Johannes Kepler, and Sir Isaac Newton, and new inventions, including the telescope, microscope, thermometer, and barometer.

# SCIENTIFIC REVOLUTION

## BIG IDEA RECAP!

- From the 1500s-1700s, Europeans experienced the Scientific Revolution, which caused people to change their views about the universe.



# SCIENTIFIC REVOLUTION

## Changing Idea: Scientific Method

### Old Science

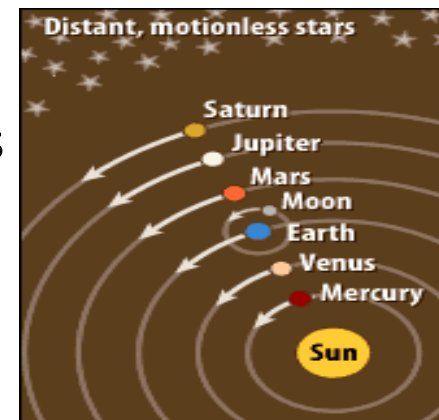
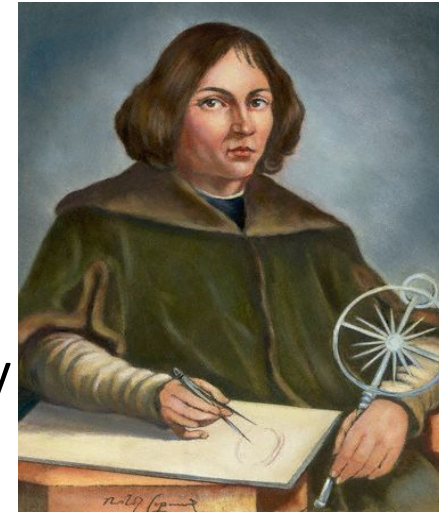
Scholars generally relied on ancient authorities, church teachings, common sense, and reasoning to explain the physical world.

### New Science

In time, scholars began to use observation, experimentation, and scientific reasoning to gather knowledge and draw conclusions about the physical world.

# Astronomy - Copernicus

- Many people believe the *Revolution of the Celestial Spheres* began the Scientific Revolution.
  - The author was Polish Astronomer Nicolaus Copernicus.
- Nearly 1,400 years before Copernicus, Ptolemy had written that the sun and planets orbited, or circled around, the earth. As Copernicus studied the movements of the planets, however, he learned that Ptolemy's theory made little sense.
- His theory was that the planets moved around the sun in circular orbits. (Heliocentric) Though he never proved this theory, Copernicus inspired fresh thinking about science.
- Despite his calculations, many scholars disagreed with his theories & continue to believe in the **geocentric model** (earth centered) proposed by the ancient Greek **Ptolemy** 1500 years earlier.

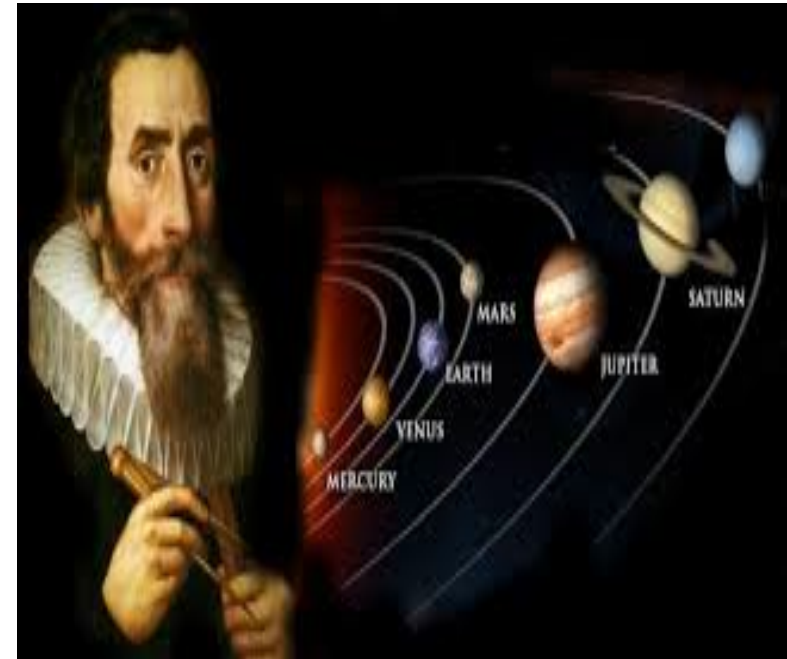


- <https://www.youtube.com/watch?v=GPBB5thPgQE>

# Astronomy – Kepler/Brahe

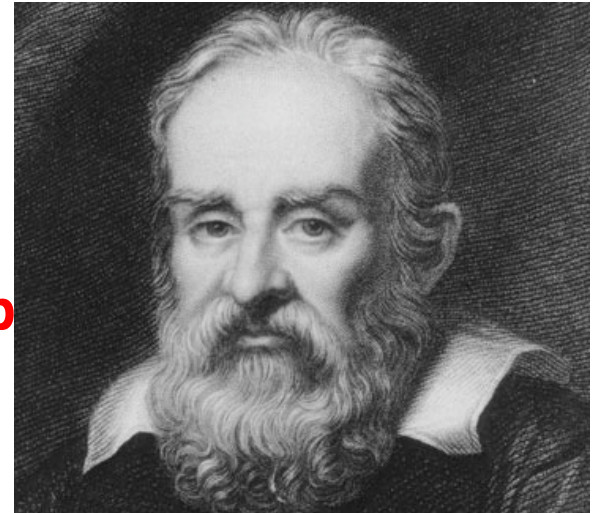
- Brahe was also an astronomer
  - He charted more than 750 stars.
  - He set an example by emphasizing careful observation and detailed accurate records.

<https://www.youtube.com/watch?v=VB3V36LJpGc>
- He was assisted by German astronomer **Johannes Kepler**.
- Kepler tried to map out the orbits of the planets.
  - He discovered that the planets did not move into circular orbits but in oval orbits around the sun. (elliptical)
    - Scientists still use this theory today.



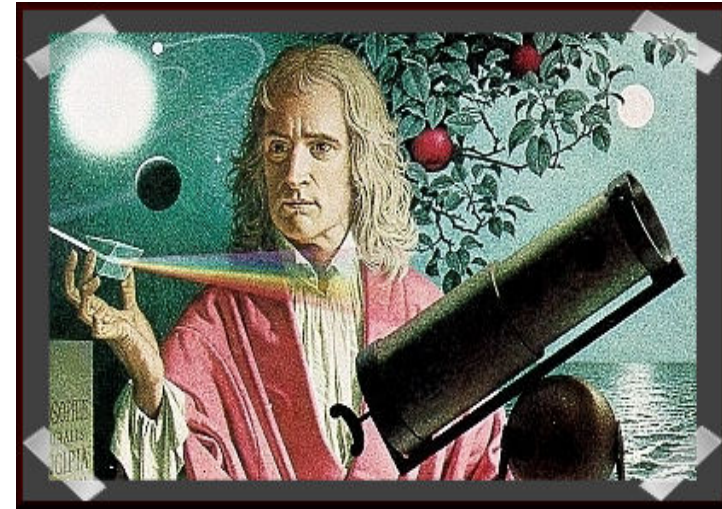
# Astronomy - Galileo

- **Galileo Galilei** was the first person to study the sky with a telescope.
  - He saw craters and mountains on the moon and discovered that moons orbit Jupiter.
- **Galileo was also interested in how falling objects behave.**
  - Today, we use the term mechanics for the study of objects and motion.
- **He was the first scientist to routinely set up experiments. He is known for mechanics.**
- <https://www.youtube.com/watch?v=2J0-ZbbrD6U>



# Sir Isaac Newton

- ***Principia Mathematica***
  - **Written by Newton**, who was one of the greatest scientists who ever lived
  - High point of the scientific revolution
- **Some of his theories have been proven so now they are called laws.**
  - **The Law of Gravity:** the force that attracts objects to each other.
    - **This keeps the planets in orbit around the sun.**



Why was the law of gravitation important?



# Sir Isaac Newton

- **3 Laws of Motion**
  - This describes how objects move in space. He went on to describe how the physical world worked.
- <https://www.youtube.com/watch?v=UuFAfD7Krhk> **1:33 minutes**
- His laws became the foundation of nearly all scientific study until the 1900s.



# New Inventions

- **Microscope** – by a Dutch lens maker.
- **Thermometer** – Galileo
- **Improved Telescope** – Galileo
- **Barometer** – Italian scientist (measures air pressure and is used to forecast the weather)
- Which one do you think is the most influential? Why?



# Effects on Society

- The **Scientific Revolution** changed so much!
- **Bacon and Descartes**
  - Thinkers Bacon and Descartes helped to create the scientific method **for performing experiments and other scientific research.**
  - Bacon urges scientists to experiment before drawing conclusions
  - Descartes advocates using logic and math to reason out basic truths. (**Reasoning**)



**Francis  
Bacon  
(1561-1626)**



**René  
Descartes  
(1595-1650)**

# Scientific Method

## DEFINITION

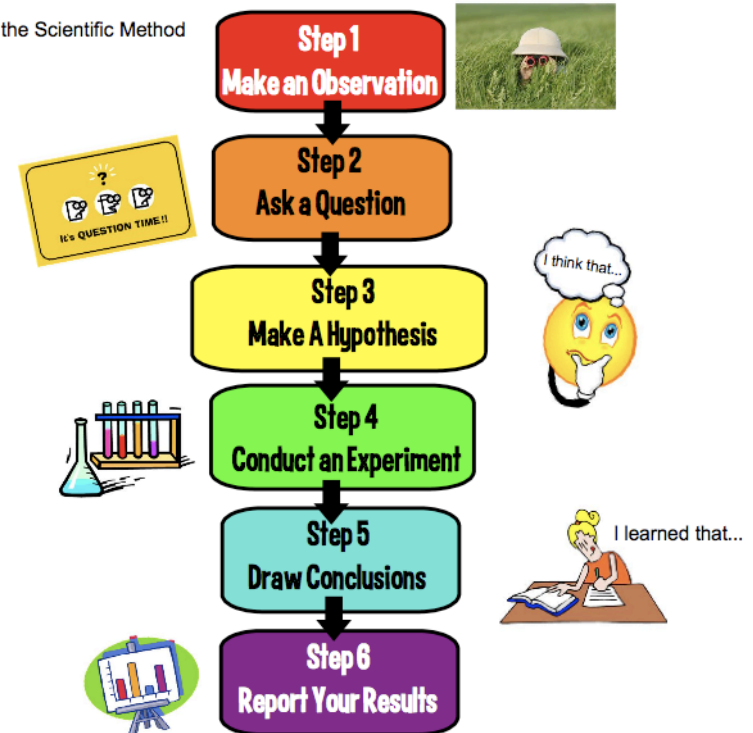
Uses observation & experimentation to explain theories on the workings of the universe.

## EXPLANATION

This process removed blind devotion to tradition from science, and allowed scientists to logically find answers through the use of reason.

This method of research is the basis for modern science.

Steps of the Scientific Method



# SCIENTIFIC REVOLUTION Recap

## I- Ideas About the Universe – Kepler

1. Old Ideas - earth was center of universe
2. New Ideas - they questioned old ideas about world

## II- Copernicus

1. Used math to suggest heliocentric theory (sun in center of universe)
  - A- Rejected by most scholars

## III- Galileo

1. Supported heliocentric theory with observation using telescope
  - A- Caused uproar with Church
  - B- Church put Galileo on trial
  - C- Threatened with death, Galileo took back his ideas publicly

## IV- Newton

1. used math to prove gravity (force keeps planets in their orbits around sun)

## V- The Scientific Method - Bacon

1. New approach to science
2. Experimentation & observation (rather than past authorities)

## VI- Descartes & Human Reasoning

1. Believed human reason (instead of tradition) should be way to discover truth
2. “I think. Therefore I am.”

**\* Thinkers of Scientific Revolution paved way for other changes in Europe \***

# Effects on society

- **Philosophers started thinking that observation and logic could explain problems such as war and poverty.** They wanted to use this to improve society. **They also believed certain laws would govern human behavior.**

# Effects on Society

- If all people were governed by the same laws, then all people were equal.
- This idea of equality was important in the development of democratic ideas in Europe.
- Science also created conflict because it raised questions about church teachings.
- Church leaders threatened Galileo with torture unless he accepted the church's belief that the earth did not move. Science still grew!

# Exit Ticket

- Choose 2 of the important people we learned about in section 1, and write a statement that summarizes their affect on society.





# Group Enrichment Activity

- Create a timeline of the Scientific Revolution using p. 590 - 592.
- Dates should include 1540 through 1570.
- On the timeline, list important events and/or people, their achievements, and important inventions.
- Choose 4 of the major thinkers, and write a statement that summarizes their affect on society.