**Causes of the Scientific Revolution**

• Before\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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• The Renaissance’s rebirth in learning inspired curiosity in many fields.

* Reformation prompted followers to challenge accepted ways of thinking about God.
* By the mid-1500s, scholars begin to challenge the ideas of ancient thinkers and the church.
* Scientific \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Causes of the Scientific Revolution**



•New \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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– Telescope, microscope, printing press, chronometer

• Mathematics played a key role in the achievements during the 1600-1700s

– Francois Viete – used letters to represent unknown quantities and laid the foundation.

 for trigonometry

– Simon Stevin – introduced the decimal system

– John Napier – invented a table of logarithms, making calculations much easier

• Ancient \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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– The rediscovery of their works made proving abstract theories with clear logical evidence

 (algebra, geometry, trigonometry) much easier.

**Ptolemaic System**

•An early challenge to accepted scientific thought came in the field of astronomy

• Ptolemy (100s), the greatest ancient astronomer, in addition to Aristotle and Christianity, \_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

– Is a series of concentric circles where the heavenly bodies are embedded in crystal-like,

 transparent spheres.

– The moon is embedded in the first sphere, Mercury the second, Venus the third, and the Sun

 in the fourth.

 – The tenth sphere is the “prime mover” that gives motion to the other spheres. – Beyond the

 prime mover is Heaven and God

• God at one end and humans at the center.

**Copernicus and Kepler**

•1543: mathematician Nicolaus Copernicus publishes a heliocentric conception of the universe.

– His \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• German \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 – Discovered elliptical orbits, which contradicted the Ptolemaic System

 – Confirmed the heliocentric view of Copernicus using mathematical data

**Galileo’s Discoveries**

• Galileo Galilei: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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– Mountains on Earth’s moon, four moons around Jupiter, and sunspots

 – 1610 – Published *The Starry Messenger*

• His observations continued to destroy the Ptolemaic system.

• Ordered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

– Threatened the Church’s view of the universe with humans not center and no scientific God

**Newton’s View of the Universe**



• Newton’s ideas would tie together those of Copernicus, Kepler, and Galileo.

• Professor of Mathematics at Cambridge University

• Wrote Mathematical Principles of Natural Philosophy (Principia)

• Defined \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

– States in mathematical terms that objects in the universe are attracted to every other objet

 by gravity

– His laws could explain all motion in the universe

**Women’s Contributions**

• ­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 – English aristocrat who was homeschooled, she studied “suitable” subjects (music, dance,

 needlepoint)

– Wrote on a number of scientific matters.

• Question the belief of humans, through science, as masters of the universe.

– Published under her own name, but not taken seriously at the time.

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

– German astronomer who married Prussia’ s foremost astronomer.

– as his assistant she made some original discoveries such as a comet.

– Denied a position as assistant astronomer at Berlin Academy.

– “Mouths would gape” if the Academy hired a woman scientist.

**Bacon and the Scientific Method**



• To understand the physical world, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ was created.

– Systematic procedure for collecting and analyzing evidence.

• Francis Bacon believed in using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to learn about nature – not ancient authorities.

• “the true and lawful goal of the sciences is none other than this: that human life be endowed with new discoveries and power”

• He wanted science to benefit industry, agriculture and trade

• Bacon believed humans could “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”