NAME: _____

Global History III
Scientific Revolution

Revolutions in Science and Philosophy

Gabrielle woke up early, eager to begin the day. At the convent school where she had spent the last six years, she had never wanted to get up. She had felt hemmed in by all the rules. The lessons on how to conduct herself in society and how to manage a household bored her. Why couldn't she have been taught about science, mathematics, and philosophy? But school was behind her. Now that she was back home in Paris, each day brought something new. She wondered if she would have a chance to talk to Monsieur Herve, her brother's tutor, as she had last evening.

What wonderful ideas he had. Gabrielle especially agreed that human nature was basically good. All one needed was liberty to develop into a kind and generous person. She remembered how spiteful 3 some of the girls at the school had been. The strict rules at the school had doubtless warped their spirits. Gabrielle had never been ill-natured. She had been disobedient toward the school authorities instead. Now she felt quite proud of her defiance. Monsieur Herve said that people had a right to rebel against tyranny.

This young woman of the 18th century is just becoming aware of new ideas about human nature and society. These new ideas clashed with what was taught in traditional schools. People now began to question established forms of government. As the century wore on, some groups joined together to overthrow restrictive governments. They hoped to replace the governments with ideal societies. These ideas and political movements developed from a new way of studying nature.

Directions: Answer the following question on separate paper.

1. Why do you think Gabrielle appears to be having trouble in the convent school?
2. Why might Gabrielle be having an even bigger problem relating to adults than many teenagers today?
3. Why do you think it was especially unusual for Gabrielle to speak with her brother's tutor, Monsieur Herve?
4. Why had Gabrielle become proud of her defiance?
5. How has Gabrielle actually experienced two very different lives during her brief lifetime?

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THE SCIENTIFIC REVOLUTION

For many centuries, scientists had accepted the writings of ancient scholars and the teachings of religious leaders about science and nature. Early in the Renaissance, scientists began to use new methods to study nature. Conclusions based on observation and experimentation became the basis for scientific theories.

Statements put forth as facts were accepted as truth only after they had been tested in experiments. These tests and their results were written down so that other scientists could repeat them. Gradually, the *scientific method* of observation, experimentation, and drawing conclusions came into common use. It led to advances in the fields of chemistry, physics, mathematics, astronomy, and medicine. This method made such major changes in the study and understanding of nature that it is said to have caused a *scientific revolution.*

The Renaissance and the Scientific Method

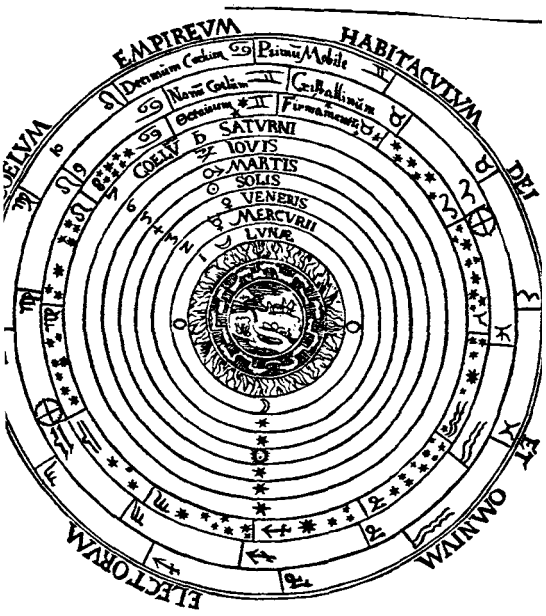
Renaissance explorers, such as Columbus and Magellan, had demonstrated that the earth is larger and more varied than Europeans had previously thought. Similarly, Renaissance scientists changed their ideas of what the heavens were like. The new understanding of the universe came about as the result of applying the scientific method to observations and theories.

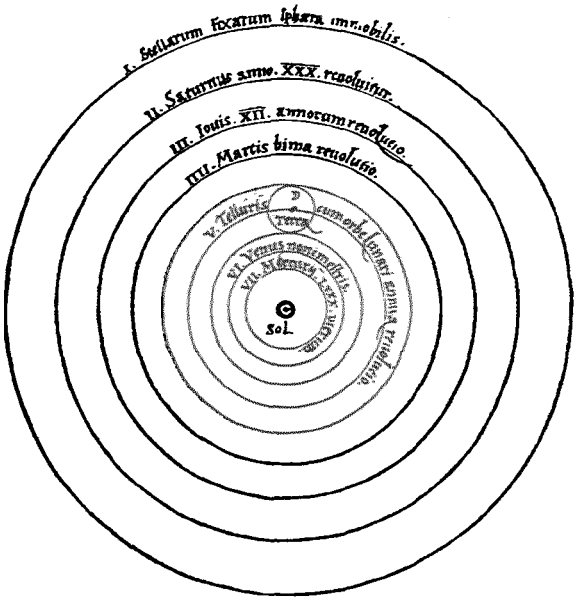
People of the Middle Ages acquired concepts of the everyday world from Christian teachings. Ideas also came from the philosophic and scientific theories of the Greek philosopher Aristotle. Christian theologians believed that the biblical account of creation was literally true. God's realm was, of course, the most important part of the universe. But it was somewhere beyond and above the solar system. Earth, being the home of human beings created by God, was the focus of God's attention. Therefore, the religious leaders and scientists of the Middle Ages thought that the earth was the center of the solar system. Aristotle's theory that the solar system *is geocentric* supported this belief. A geocentric solar system is one in which the sun and all the planets revolve around earth, which does not move.

Copernicus. Interestingly enough, the first person who challenged this view of the solar system was a devout clergyman from Poland called Nicolaus Copernicus (lived 1473-1543). Copernicus was an astronomer as well as an authority on church law. In his astronomical studies, he had read the theories of the astronomer

Ptolemy, who lived during the 2nd century A.D. in Alexandria, Egypt. Ptolemy had developed rules based on the geocentric model of the solar system. The rules helped other astronomers follow the paths of the planets in their revolutions around the earth.

These rules were so complicated and sometimes so inaccurate





Copernicus began to feel that God could not have made a geocentric solar system. If God had done so, Copernicus thought, He would not have been perfect. Copernicus turned to a model of the solar system that had been proposed by Aristarchus, a Greek astronomer who lived in the 200s B.C. This was a *heliocentric* model in which the earth and all the other planets revolved around the sun. Copernicus found that the heliocentric model explained the pathways of the planets better than the geocentric model. For nearly 40 years, Copernicus studied and tested Aristarchus's assertion that the solar system is heliocentric. Finally, he wrote a book, *On the Revolutions of Heavenly Bodies,* that discussed the theory. It was published in 1543, the year Copernicus died.

Although Copernicus had written his book to demonstrate the perfection of God's creation, it outraged religious leaders. Not only did it contradict the Bible, it gave human beings an insignificant place in the universe. Most scientists of the time complained that Copernicus's theory lacked common sense. "If the earth is spinning around the sun," they asked, "why doesn't everything fall off it?" A century passed before scientists began to consider the heliocentric solar system a possibility.

Directions: Answer the following question based on the reading.

1. If Copernicus was such a religious man, why did he believe that a geocentric system was correct? _____
_____
_____
_____

2. Why do you think other religious men condemned the ideas of Copernicus if he was proving that God created a more perfect system? _____
_____
_____
_____

3. If people were so upset by the heliocentric model of the solar system that Copernicus proposed, why did it eventually replace the geocentric version? _____
_____
_____
_____
_____
_____

SCIENTIFIC REVOLUTION

I. Scientific Revolution
- A. began during the Renaissance and continued during the Age of Kings
  1. rejected traditional authority
  2. rejected Church teachings
  3. favored direct observation of nature
- B. Scientific Method
  1. observed nature
  2. made hypotheses - educated guesses
  3. tested hypotheses through experiments

II. Outstanding Scientists
- A. Nicholas Copernicus (1473-1543)
  1. the sun was the center of the universe
  2. went against what the Catholic Church taught
- B . Galileo Galilei (15 64-1642)
  1. used a telescope to conform Copernicus' theory
  2. Church banned his book
- C. Sir Isaac Newton (1642-1727)
  1. Principia Mathematica
  2. Law of gravity