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## Course Overview

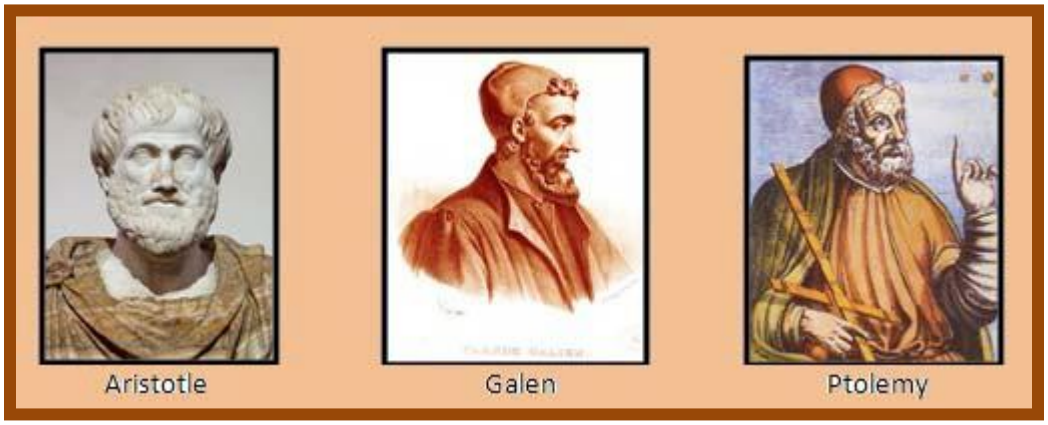
Why are students required to study world history when they have already read the history of their own country? The answer is both simple and complex. Knowledge of local history is not sufficient for people who will spend their lives on a relatively small interconnected planet. This class examines many of the events from 1750 to the present era and considers their ongoing impact on the world community. The course also addresses economic, political, social and cultural developments which shape our thoughts and values. In short, to understand world history is to understand our past, present and future.

# SCIENCE CHALLENGES THE PAST

STOP: Complete Section A Questions

## Life in the Middle Ages (450 A.D. – 1200 A.D.)

For centuries Western Europe relied on the Roman Empire for order, protection and principles. However, when Roman roads and Roman laws collapsed, the Roman Catholic Church became the civilizing force throughout all of Europe. Although the Church would continuously battle to maintain its predominant position, it succeeded in establishing monasteries, strengthening the powers of the Pope and overcoming opposition of the Germanic tribes. For almost one-thousand years Europeans based their thoughts, decisions and academic studies on the Bible. It became the primary source for information during the Middle Ages, an era which also became known as the Age of Faith.




Much of the scientific inquiry of the Middle Ages centered on alchemy, a blend of chemistry, philosophy and magic. However, the scientists of the ancient world continued to be regarded as the ultimate authorities in their fields. The writings of Aristotle, a Greek philosopher and physicist, were accepted without question. His theory that there could be no movement without a force gained the approval of the Roman Catholic Church since it fit the concept that God moved the universe. Ptolemy, a Roman citizen of Egypt, remained the world's most noted astronomer for centuries after his death. He advocated the idea that the earth was the center of the universe with the planets and the sun following circular patterns around it. The medieval knowledge of medicine was also based on the writings of the past. Galen, who served a doctor to gladiators and the Roman Emperor Marcus Aurelius, theorized that the liver was the most significant organ in the human body and believed that the heart pulled blood from the veins and did not pump it to the rest of the body. Although this concept was eventually found to be incorrect when dissection became an accepted form of scientific study, Galen's writings made valuable additions to the medical field. Even though most people in the Middle Ages looked to the past and the Bible for knowledge and direction, the fourteenth century saw the beginnings of change.

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## Causes of the Scientific Revolution

The Scientific Revolution, an era in which many new discoveries emerged in science and philosophy, did not change established beliefs overnight. It began by affecting only a few scholars and philosophers. However, the movement eventually spread to all people and continues to impact our current worldview. Several factors led scientists to challenge old, familiar theories and to develop new ones. Scholastic institutions, such as Oxford University in England, the University of Padua in Italy and the University of Paris in France, began to include courses in mathematics, physics and astronomy as part of their standard curriculum. As the Renaissance unfolded throughout the fourteenth through the seventeenth centuries, it focused attention on living in the current world rather than preparing for heaven. The Reformation, which demanded changes in the Roman Catholic Church and eventually led to the formation of new churches, supported the questioning of traditions and concepts.

Exploration also encouraged the Scientific Revolution. In 1484, for example, Portugal appointed a commission of mathematicians to research and to improve navigational tables for sailors. This also resulted in a variety of new scientific instruments such as the barometer, thermometer and telescope. The expansion of trade brought an exchange of ideas with both Islamic and Oriental cultures. Fueled by the invention of the printing press, the rise of modern science created an international scientific community linked by common interests and values. Governments also recognized the financial benefits of research and funded national academies of science. The English crown set a precedent for this when King Charles II granted a charter to the Royal Society of London to continue its experiments and recording of data in the area of natural science.

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## Why Europe?

Why did the Scientific Revolution take root in Europe rather than other parts of the world? Arab scholars gained an impressive array of knowledge in the areas of medicine, mathematics and astronomy from 800 to 1400. In the centuries following the year 1000, China experienced economic growth as well as technological advancement. However, neither of these civilizations paralleled a breakthrough equal to the Scientific Revolution.

Trade and the influence of the universities set Europe apart in the acquisition of knowledge. Institutions of higher learning throughout Europe were more favorable to new ideas in spite of the opposition of the Roman Catholic Church, and the legal system gave them a greater degree of independence. Arabic schools of higher learning, once known for their openness and tolerance, focused on Islamic law rather than natural science and were suspicious of subjects that seemed contrary to religious traditions. China concentrated on preparing people for government careers and successful completion of the civil service exam necessary to obtain those positions. As a result, science remained outside the system of higher education there as well. Western Europe, due to exploration and the exchange of products with other areas of the world, was also in a better positioned to draw on the knowledge of other countries. Therefore, Europeans were motivated to learn more and to delve deeper.

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## Major Scientific Discoveries

The scientists of this new age changed their approach to research and problem-solving. Logic replaced faith in the study of natural science; observation and experimentation became the key components of scientific study. Statistics were recorded and published so that information was more accessible. The barometer, thermometer and other new tools were developed to assure accurate measurements while mathematics reached a new level of importance. Although scientists pushed aside the old barriers in many areas, it was the physicists and astronomers who led the way.

Nicolaus Copernicus made the first great departure from the medieval system. Based on mathematics, he claimed the earth was part of a heliocentric or sun-centered system as opposed to a geocentric or earth-centered system. Tycho Brahe, a Danish astronomer, agreed with Copernicus on several points. He spent twenty years carefully tracking and noting the movements of various stars. Although he made his observations with the naked eye, his observatory was one of the most sophisticated of its day. His assistant, Johannes Kepler, was a brilliant mathematician, who used Brahe's records to conclude that planets moved in elliptical as opposed to round orbits.

The first scientist to make extensive use of the telescope was Galileo Galilei. He saw the craters on the earth's moon as well as the moons rotating around the planet Jupiter. Galileo also conducted many controlled experiments; they led him to conclude that an object continues forever in motion unless it is stopped by some outside force. Continuing to experiment and to observe the effects of force on motion, Isaac Newton expanded Galileo's work and added the law of universal gravitation. Astronomers were not the only members of the scientific community to make new discoveries based on observation. Andreas Vesalius published a medical book in 1543 which contained illustrated drawings of the human body. Using information gained through dissection, the sketches detailed human bones, muscles and organs. However, new ideas were often greeted with a certain amount of suspicion and distrust, and the concepts of the Scientific Revolution were no exception.

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## Conflict with the Church

Both Catholic and Protestant churches had encouraged the study of science in past, and most prominent scientists were active members of their own religious communities. However, the new concepts conflicted with established traditions and were thought to undermine the authority of churches in general. For example, the revolution in astronomy, which stressed a heliocentric rather than a geocentric universe, contested the long-held view of the Roman Catholic Church. As a result, the Church banned the teachings of the Copernicus. Galileo, whose observations supported the findings of Copernicus, published a book in 1632. This work, Dialogues of the Two Great World Systems, described both a sun-centered universe as well as an earth-centered one. Although he insisted he had remained neutral, the Roman Catholic Church interpreted the document as making a stronger argument for Copernicus' theory. As a result, Pope Urban VIII summoned Galileo to Rome in order to stand trial before a Holy Tribunal. The official charges are described in the following document.

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## What Does It All Mean?

In the short-term, the discoveries of the Scientific Revolution had little effect on the daily lives of average people. Its long-term effects, however, cannot be overestimated. The movement fundamentally altered the position of humankind within the universe and challenged the authority of the Church. Experimentation and observation led to a path of reasoning which overturned political systems and inspired technological innovations. As you continue to study world history, however, you will discover that these achievements had both positive and negative results.


Below are additional educational resources and activities for this unit.

Unit 1 Main Points Worksheet
Unit 1 The Birth of Modern Science
Unit 1 Copernicus