

The Scientific Revolution

Some Europeans were attempting to spread the Christian faith around the world however there were others who challenged the traditional teachings of Christianity. These were the founders of Europe's Scientific Revolution.

The Scientific Revolution was a vast intellectual and cultural transformation that took place in Europe between the mid-sixteenth and early eighteenth centuries.

The major breakthrough was from scientists who, through science, disagreed or disproved the ancient philosophers, cultural traditions and the divine word of the scriptures.

The understanding of life now came from a combination of

- careful observations
- controlled experiments
- the formulation of general laws, expressed in mathematical terms

Why did this revolution take place in Europe?

Looking back in time a person may have guessed that a Scientific Revolution may have started in the Muslim world. After all, from 800 to 1400 BCE Arab scholars were the most advanced in mathematics, astronomy, optics, medicine and scientific books. Confucianist China may have been another guess. Their culture was sophisticated and was not tied down by religious practices. Confucianism was more of a belief system than a religion. So why then did this Revolution start in Europe?

Most historians agree that Europe created the Scientific Revolution because of its economic and legal systems. In the 12th and 13th centuries the European legal system had created independence for many institutions within the continent – the Church, towns, cities, guilds, professional associations, and universities. The Roman Catholic Church had autonomy from secular authorities, making Europe different to the Islamic world.

The development of science in the West came from the universities. Scholars in the Universities of Paris, Bologna, Oxford, Cambridge and Salamanca studied in relative freedom from the dictates of the church or state authorities. They studied the ancient masters such as Aristotle and had the rights to set and create their own courses.

[Islamic science was second in learning to religion and in China the authorities did not allow independent study, except for civil service examinations].

Europe used cultural diffusion to expand science. As part of the exchange they brought into the continent Arab medical texts, astronomical research, especially from the observatory of Maragha (present day Iran) and Arabic translations of the Greek classics.

From the 16th to 18th centuries Europeans amassed vast amounts of information about foreign lands, peoples, plants, animals, societies and religions. This new information shook up the old traditional ways of thinking about the world as they once knew it!

Before the Scientific Revolution, Europeans held the view derived from Aristotle who lived in the second century C.E. To medieval European thinkers, the earth was stationary and at the center of the universe [the **Geocentric Theory**]. They thought the sun, moon and stars, embedded in ten spheres of transparent crystal, circled around our planet. The Catholic Church backed this concept as they preached that the entire universe was centered around the earth, and where its inhabitants lived for religious salvation.

The first major breakthrough of the Scientific Revolution came from **Nicolaus Copernicus**. He was a mathematician from Poland who wrote a book in 1543 called *On the Revolutions of the Heavenly Spheres*. His theory was that “at the middle of all things lies the sun” and that the earth and all of the other planets, revolved around the sun. Therefore the earth was no longer at the center of the universe, nor the center of God’s attention! This helped create the **Heliocentric Theory**.

In the early 17th century, a mathematician from Germany, **Johannes Kepler**, proved that planets followed elliptical orbits and did not, as previously believed, move in perfect circles.

Galileo Galilei improved on the telescope. His discovery of the moons of Jupiter and many new stars suggested a cosmos far greater in size than previously thought. However, Galileo also, through the detection of sunspots, challenged the Catholic Church theory that the heavenly bodies never changed and had no imperfections.

By now some thinkers believed that there were other inhabited worlds or other kinds of humans on different planets. Some began to discuss the theory that Earth was a mere speck of dust in a universe so vast we could not comprehend its size. The French mathematician and philosopher Blaise Pascal (1623-1662) said “The eternal silence of infinite space frightens me.”

Sir Isaac Newton, an Englishman, formulated the concept of universal gravitation. His concept meant that an apple falling from a tree or the motion of a cannonball was identical to the natural laws that governed the planets.

Knowledge now came from human reasoning and not the bible.

“the machine of the universe is not similar to a divine animated being but similar to a clock.” - Johannes Kepler.

“to seek no other knowledge than that which I might find within myself, or perhaps in the book of nature.” - René Descartes

Major Thinkers and Achievements of the Scientific Revolution

Thinker / Scientist	Achievements
Nicolaus Copernicus Polish: 1473-1543	<ul style="list-style-type: none"> • The sun is at the center of the solar system, the earth rotates on its axis, • the earth and other planets revolve around the sun
Andreas Vesalius Flemish: 1514-1564	<ul style="list-style-type: none"> • “Father of Anatomy” • made detailed drawings of human body based on dissection
Francis Bacon English: 1561-1626	<ul style="list-style-type: none"> • Emphasized observation and experimentation as the key to modern science
Galileo Galilei Italian: 1564-1642	<ul style="list-style-type: none"> • Developed an improved telescope • discovered sunspots • discovered mountains on the moon • discovered Jupiter’s moons • performed experiments on the velocity (speed) of falling objects
Johannes Kepler German: 1571-1630	<ul style="list-style-type: none"> • Planets follow elliptical, not circular orbits • described laws of planetary motion
William Harvey English: 1578-1657	<ul style="list-style-type: none"> • Described the circulation of blood and the function of the heart
Rene Descartes French: 1596-1650	<ul style="list-style-type: none"> • Emphasized the importance of mathematics and logical deduction in understanding the physical world • invented analytical geometry
Isaac Newton English: 1642-1727	<ul style="list-style-type: none"> • Synthesized earlier findings around the concept of universal gravitation • invented calculus • formulated the concept of inertia • formulated the laws of motion

The Church and science had several conflicts due to these findings. For example, the Italian philosopher Giordano Bruno, who proclaimed an infinite universe and many worlds was burned at the stake in 1600. Galileo was forced to renounce his belief that the earth moved around an orbit and rotated on its axis.

None of the early scientists rejected Christianity. The church gradually allowed these new ideas but insisted that religion held the key to the ultimate questions regarding human salvation and the larger purpose of the universe.

“This most beautiful system of the sun, planets and comets could only proceed from the counsel and dominion of an intelligent being.” – Isaac Newton.