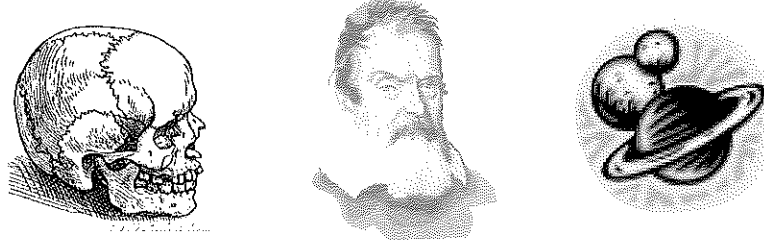


## The Renaissance

# "Science & Medicine"



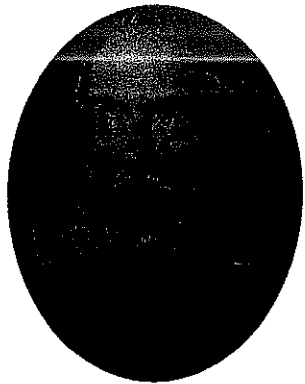
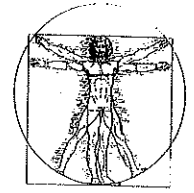
During the Middle Ages, people's lives were centered around the church and their religion. As the 1500's arrived some people were beginning to think differently about the role and power of the church. The 'HUMANISTS' like Petrarch, were questioning people's decisions and asking why things were the way they were.

These Humanists gave rise to a whole new shift amongst the educated members of society. With more and more people asking "why" and "what if..." new ideas spread and a scientific revolution began.

New ideas included: (for the first time in history)

- Medicine - human anatomy and new medical procedures
- Science- examining the stars and planets. The first telescope of the Renaissance.
- Church- questioned role of the church and questioned the power that some people in the church had.

# ASTRONOMY



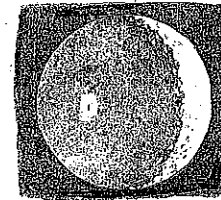
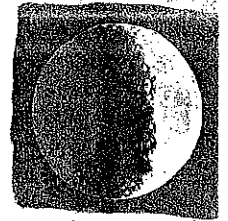
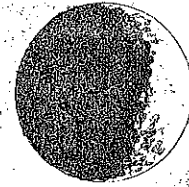
Galileo Galilei. Among his discoveries were that the Milky Way was a mass of hundreds of thousands of stars and the planet Jupiter had four moons.

Copernicus' universe, with the sun at the centre. Although it contained new ideas it still suggested that the planetary orbits were perfectly circular.

**R**enaissance astronomers used the new scientific methods of experimenting and observing to study the heavens. Their sensational discoveries shook European beliefs about the world.

## GREEK IDEAS

Some of the ideas of Ancient Greeks were quite accurate. Pythagoras proved that the earth was round, and Aristarchus suggested that the earth and planets revolved around the sun. However, many of these sensible ideas were forgotten, or replaced by Ptolemy's theory of the universe written in about AD 100. Ptolemy believed that the universe consisted of spheres made of a crystal-clear substance. The planets and stars were embedded in the spheres, which were arranged one inside the other, all revolving around the earth. The Church approved of Ptolemy's theory because the 'architecture' of the heavens was based on the circle, the most 'perfect' shape. Also, the heavens were made of pure material rather than the



These are Galileo's drawings of the phases of the moon which he saw through his primitive telescope in about 1610. He was the first person to give names to lunar features.

common matter of the earth. At the centre of this universe was the earth, the Church and God.

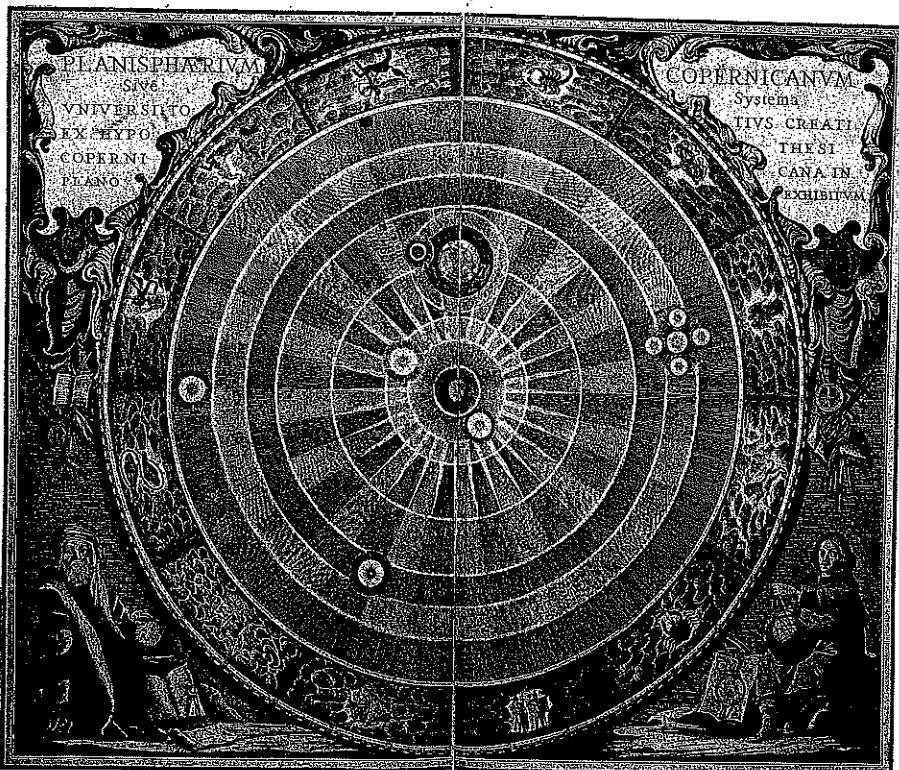
## NICOLAUS COPERNICUS

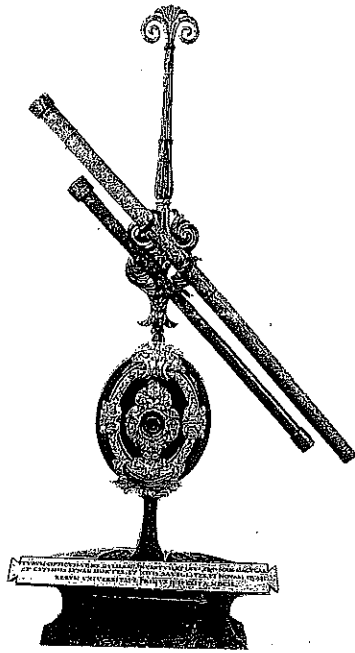
Copernicus, a Polish astronomer, began to doubt Ptolemy's ideas when he realized planets sometimes appeared to move backwards. In 1543, he published a book called *De Revolutionibus (Concerning the Revolutions of the Celestial Spheres)*. It suggested that the sun was the centre of the universe, and that the earth and planets travelled around it.

## TYCHO BRAHE

Brahe, a Danish astronomer, extended Copernicus' system. Making measurements of amazing accuracy, he calculated the position of over 800 stars and made careful observations of the movements of Mars.

When Brahe died in 1601, his pupil, Johannes Kepler, took over his work. Kepler discovered not only that the planets revolved around the sun, but that they moved in elliptical (oval) orbits. This shattered the old idea of the perfect circular motion of the heavens.





Galileo's telescope, though primitive to our eyes, was large and powerful enough to gather convincing evidence that the earth and all the planets rotated round the sun.

### THE ANGER OF THE CHURCH

In 1610 Galileo became one of the first persons to use the newly invented telescope to observe the sky. In the same year he wrote *The Starry Messenger*, explaining that his observations confirmed what Copernicus had suggested.

The Copernican system undermined the Church's teaching. It attacked the idea that the Church and God were at the centre of a perfect universe. It also contradicted stories in the Bible. Therefore Copernicus was named a heretic and his book seized and placed on the Church's *Index of Forbidden Books*. When Galileo claimed to have seen many of the things suggested by Copernicus, he too was accused of heresy. He was threatened with torture unless he denied everything he had written.

**'I, Galileo... do swear that I have always believed, do now believe and, with God's aid shall believe hereafter, all that which is taught and preached by the... Church. I must wholly forsake the false opinion that the sun is the centre of the world and moves not, and that the earth is not the centre of the world and moves...'**

Galileo

Legend has it that, after making this oath, Galileo whispered 'And yet it [the earth] does move.' Galileo was forced to retire from his work. He spent the rest of his life under arrest in his house, writing.

### THE TRUTH REVEALED

In 1687, 45 years after Galileo's death, Isaac Newton published *Principia Mathematica*, which laid down the laws of motion and gravitation (gravity). This was the first complete and accurate explanation of what was happening in the heavens. It was perhaps the greatest scientific work ever published, and it justified the belief of Renaissance scholars that observation and experimentation were the key to knowledge.

*Tycho Brahe's extraordinarily accurate astronomical measurements were made with the naked eye using an armillary sphere with a diameter of three metres (shown below) and a great quadrant nearly five metres high painted on the wall of his observatory.*

