

# Models of The Cosmos

Name: \_\_\_\_\_

Date: \_\_\_\_\_

If you look up at the sky at the stars at night you will notice that the constellations move as the night progresses. In the Northern Hemisphere, a time lapse photograph would show them moving in a circle around the North Star, Polaris. But are they moving? What's really going on?

People in ancient times looked up at the stars and wondered how the solar system worked. They believed that the Earth was flat and that all of the celestial bodies such as the Sun, the Moon and the stars were contained in a dome over the Earth called the heavens.

The ancient Greek philosopher, Aristotle (384-322 BC) believed that the Earth was a perfect sphere that was fixed in its position. He reasoned that celestial bodies such as the Sun moved in circles around the Earth. Ptolemy, a Greek-Egyptian philosopher, used his observations of the Moon, the Sun and the planets to develop a more detailed Earth-centred model of the cosmos. This Earth-centred model was accepted as truth for many hundreds of years. It made sense, at the time, considering that the Sun appears to track across the sky as though it were orbiting the Earth.

Great thinkers in China and the Middle East took measurements of the stars and plotted their positions on maps. They looked at patterns in the behaviour of the Sun and the Moon and tried to predict when events like eclipses would occur. Some of these scholars theorised about the Earth's position in relation to the Sun and the stars. But most people, by the 1500s, believed that Ptolemy's model of the cosmos was correct.

The greatest challenge to people's accepted beliefs happened in 1543, when Nicolaus Copernicus reasoned that the Earth and all the other planets orbit in circles around the Sun. At the time, people had a hard time believing him. It took another sixty two years before the work of Johannes Kepler began to change some people's minds.

Kepler published his 'Laws of Planetary Motion' in 1609. His calculations indicated that the Earth and all the other planets travel in elliptical paths around the Sun. However, the Church, which had great power at the time, disagreed and banned people from promoting the idea. Supporters risked being arrested for heresy. Galileo Galilei, a well respected physicist, mathematician and astronomer, was the first to use a telescope to observe the stars. His observations led him to support the heliocentric view of the cosmos. He was placed under house arrest in 1633 until his death in 1634.

When Isaac Newton published his Law of Universal Gravitation in 1687, all doubts about the heliocentric model of the cosmos were put to rest. The Church finally lifted the ban on works supporting Copernicus' theory in 1758.

The geo-centric model of the cosmos ('geo' meaning of the earth and 'centric' meaning centre) proposed by Ptolemy in 140 AD was replaced by the heliocentric model ('helios', the Greek word meaning sun and 'centric' meaning centre.) It was confirmed as the preferred model of the cosmos by astronomers such as Galileo Galilei, Johannes Kepler and Sir Isaac Newton.



Nicolaus Copernicus

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Choose the correct answers:

1) What nationality was Aristotle?

- Egyptian
- Greek
- Chinese

2) When did Aristotle come up with his theory about the cosmos?

- In ancient times
- In the middle ages
- In modern times

3) According to Ptolemy and Aristotle, what was at the centre of the universe?

- The Earth
- The Sun

4) What lies at the centre of the universe in the heliocentric model?

- The Sun
- The Moon
- The Earth

5) Who first proposed that the Sun was at the centre of the universe and that the Earth moved around it?

- Ptolemy
- Copernicus
- Kepler

6) What did the Church think of this idea?

- They accepted it as truth
- They dismissed it as a lie

7) People who supported Copernicus' theory were arrested for heresy during the 1600s. True or false?

- true
- false

8) Which model did most people accept as truth during the 1500s?

- Copernicus' Model
- Ptolemy's Model
- Kepler's Model

Investigate and write the answers:

1) Why was Galileo Galilei arrested in 1633?

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2) Why do you think ancient people believed the Earth was flat?

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3) What are celestial bodies?

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4) Why do you think it was so difficult for people to accept Copernicus' Theory?

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5) Which astronomers finally proved that the heliocentric model of the cosmos was true?

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