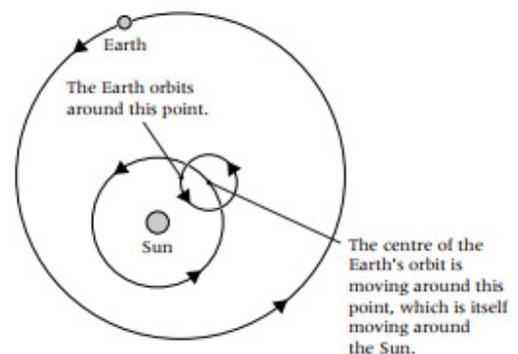


# The relationship between the Sun, Earth and Moon - literacy task

Over time astronomers have used observations of the night sky to describe the relationship between the Sun, Earth and Moon.

Ptolemy's model of the Universe had the Earth at the centre, with the Sun, planets and stars revolving in circular orbits around the Earth. The model could be used to predict where in the sky a planet would be at a particular time. Unfortunately, lots of adjustments to the model had to be made to make it fit the observations of the planets.

Of course – this could mean that the aliens just don't like us, but Hubble correctly reasoned that When Copernicus developed his ideas about a Sun centred Solar system, he still put his planets in circular orbits. All that time, everyone believed that the Universe was made by God, and God would only have used 'perfect' Shapes like circles. Copernicus' model was a little simpler than Ptolemy's, but it still needed lots of complicated adjustments to make the predictions of the model fit the observations.

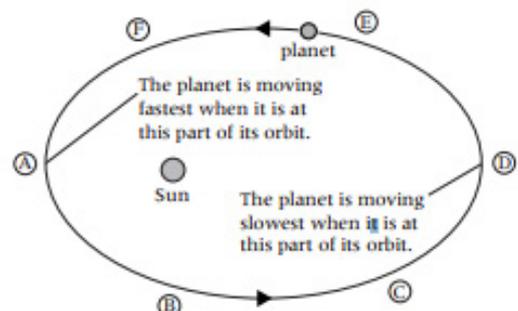


*Copernicus' model of the Solar System, which used complicated sets of circles to describe the motion of the Earth and the other planets around the Sun.*

It was a long time before everyone accepted that the Sun, not the Earth, was at the centre of the Solar System. There were many reasons for this; one reason was that it was still very complicated, and another was that Christian beliefs at the time held that the Earth was at the centre of the Universe.

Tycho Brahe (1546–1601) was an astronomer who worked in Denmark and Prague. He spent years making detailed observations of the positions of the planets. In 1600 he took on Johannes Kepler (1571–1630) as an assistant, and asked him to study the orbit of Mars, which was very difficult to predict using Copernicus' model.

Kepler started by working out the speed of Mars at different places around its orbit and discovered that its speed changed. This discovery eventually led him to the idea that the orbits of the planets were ellipses, not circles. Once he worked out the orbits of the planets using this idea, his model matched observations very well. It took Kepler eight years to make all the calculations and check his theory, but this theory is now accepted by astronomers everywhere. He published his ideas in 1609.



*Note that the orbits of the planets are almost circular – the ellipse in this diagram is exaggerated.*

*A planet in an elliptical orbit (you will need the letters on the diagram when you answer questions 4 to 7).*

At the time, no one knew why Kepler's ideas worked. It wasn't until Isaac Newton (1642–1727) published his ideas about gravity in 1687 that scientists could explain why the speeds of the planets changed at different places in their orbits

## Questions

- ① Why wasn't Copernicus' model of the Solar system accepted by most astronomers when his ideas were first published?
- ② What did Copernicus assume about the shapes of orbits of planets and what do you think he assumed about the speeds of the planets and their orbits?
- ③ Compare Kepler's assumptions about orbits with those of Copernicus.
- ④ Create a timeline showing how ideas about our Solar system have changed over time. Use the information above and any other knowledge you may have.