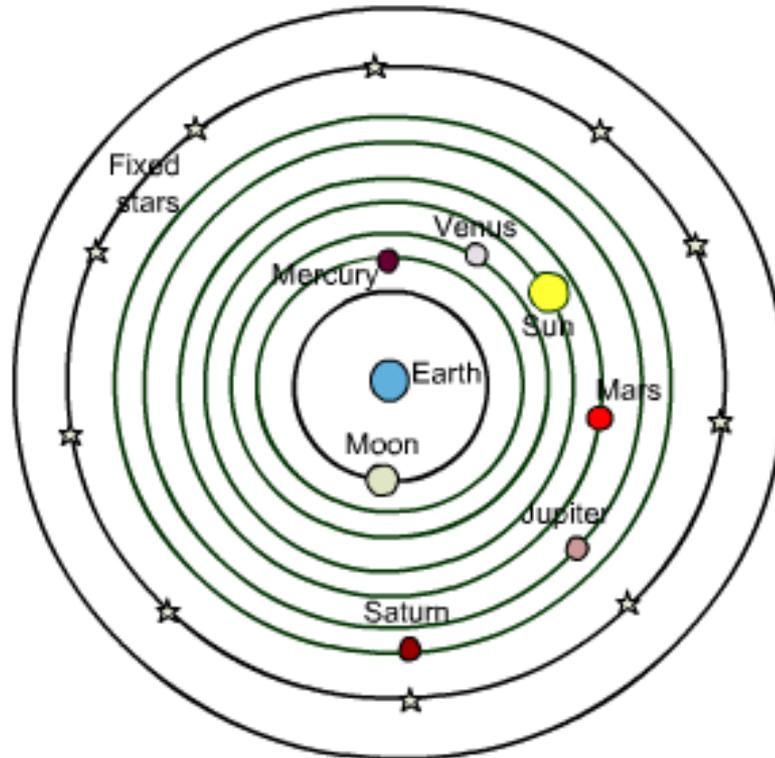


Our Changing View of the Universe

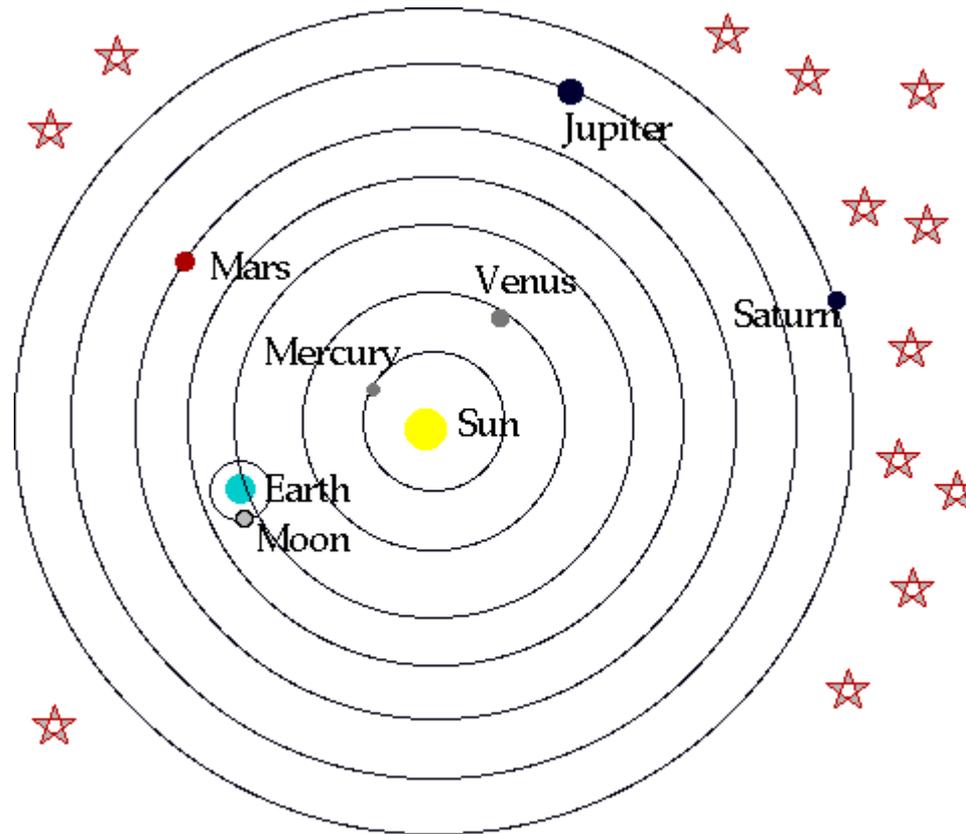
Chapter 10.2 and 10.3

- Our earliest models are **geocentric** . . .



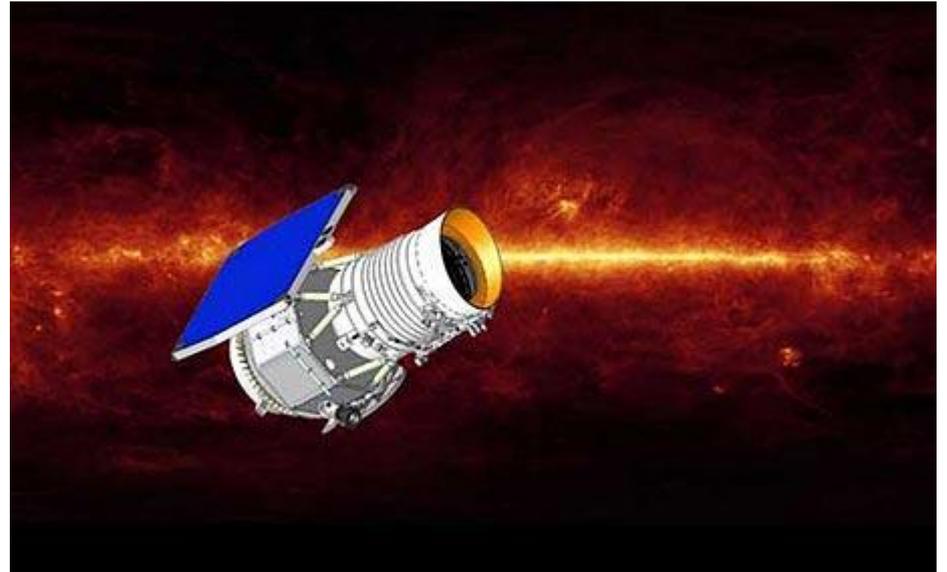
...with the earth at the centre of the universe and all the celestial bodies revolving around it.

- New observations and calculations of planetary motion led astronomers to a **heliocentric** model...



... with the earth and other planets revolving around the sun.

- Modern technology continues to improve ...



- This allows even further understanding of our own solar system and galaxy, as well as distant galaxies and planets.

Early Astronomers...

– Aristotle (383-322 B.C.E.)

- Believed in a **geocentric** universe...
- Since the patterns of stars in the sky did not change, the earth must be in a fixed place and everything revolves around it
- VERY influential!!

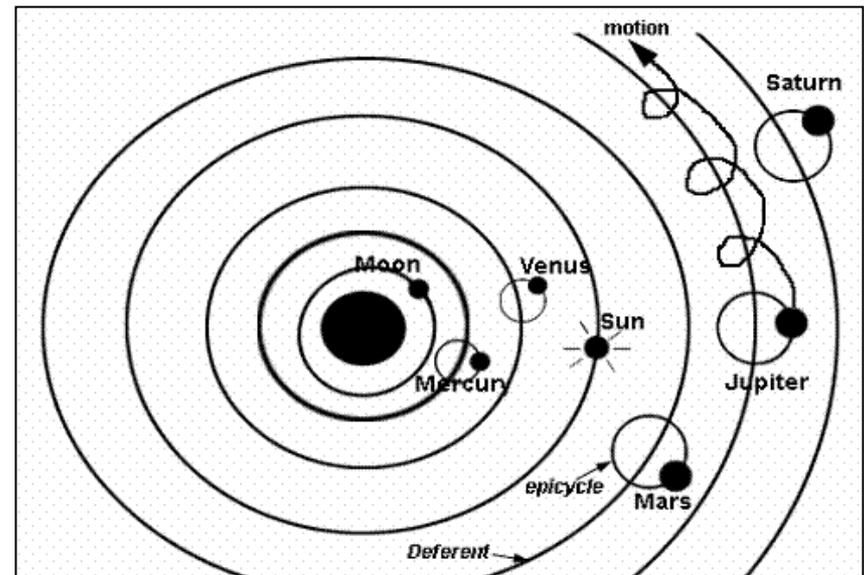


Early Astronomers...

– Ptolemy (83-168 C.E.)

- Also believed in a geocentric universe
- Tried to better explain the observed motion of the planets (e.g. the *retrograde motion* of planets at times)

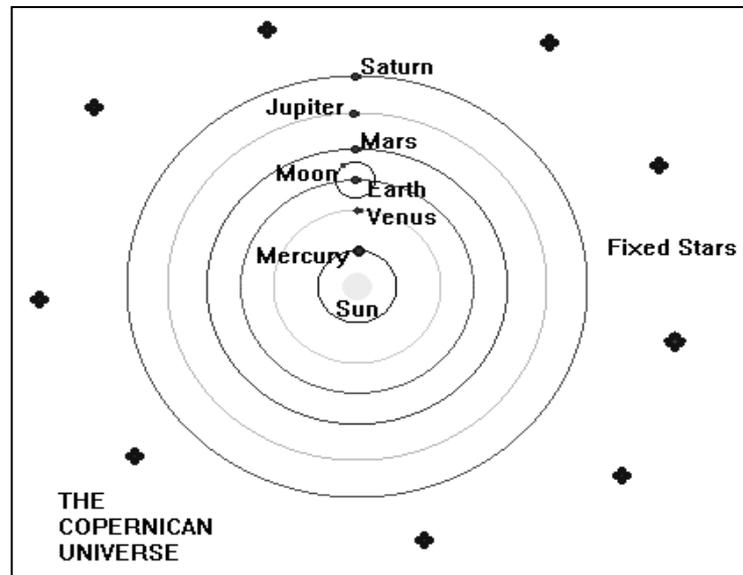
- Ptolemy proposed that planets revolved around an off-centre wheel called an **epicycle** and that wheel then revolved around the Earth



We start to get it right...

– Nicolaus Copernicus (1473-1543)

- Bravely proposed a heliocentric model

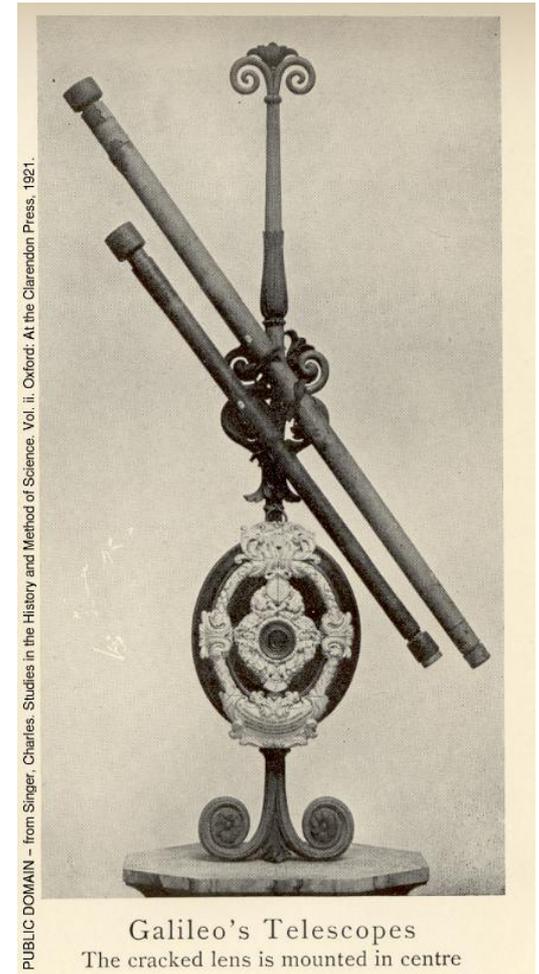


- Movements of the planets are explained **if the Earth revolves around the sun** once per year and rotates on its axis once per day

More evidence for the heliocentric model...

– Galileo Galilei (1564-1642)

- First to use a telescope and record resultant observations
- Noticed that Venus had phases... he figured the planet could only have phases if **it orbited the sun!**

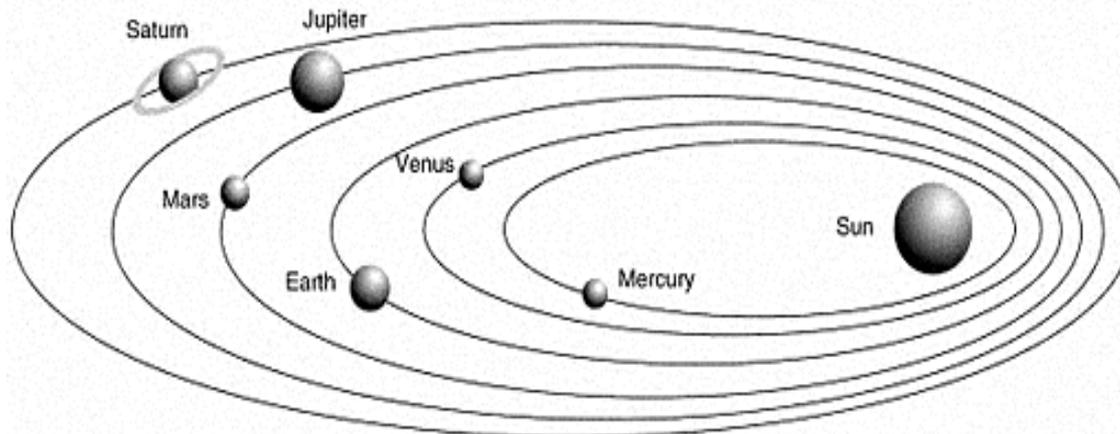


- Galileo published his views → they opposed the view supported by the very powerful church and he was consequently tried and imprisoned.

Now we're really getting it...

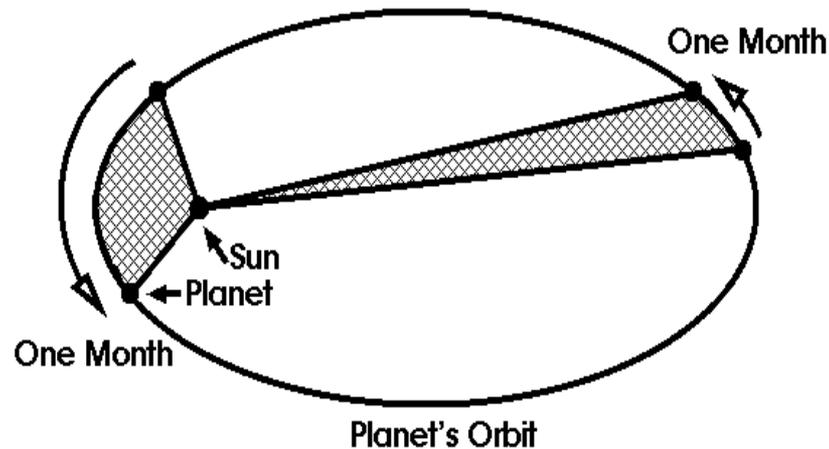
– Johannes Kepler (1571-1630)

- Used observations made by Tycho Brahe of the positions of the planets
- Using the data collected and mathematical formulas he created, he developed his three laws of planetary motion:
 - 1) All planets move in ellipses around the sun



Kepler's Laws continued...

- 2) A planet closer to the sun speeds up and when its further away it slows down causing it to sweep out equal areas in equal times (see text p377)



- 3) The time a planet takes to revolve around this sun is directly related to how far away it is

Newton fills in the rest...

- Newton (1643-1727)
 - Showed using mathematics that the force of gravity affects all celestial bodies causing them to orbit around larger bodies



A “final” word...



NASA / AURA / STSCI

- The basic model of our solar system hasn't changed since Newton
- **But**, technological advances and further observation has increased our understanding of our own solar system, what is in our galaxy and beyond.

Foldable → to be handed in!

- Complete your foldable using the information in the notes and textbook:
 - Write each name on one of the 6 flaps:
 - Aristotle
 - Ptolemy
 - Nicolaus Copernicus
 - Galileo Galilei
 - Johannes Kepler
 - Sir Isaac Newton
 - Under each flap, use jot notes to describe the contribution each of the following individuals made to our understanding of the movement of celestial bodies
 - On the back of the flap, use a diagram or sketch to help explain that individual's beliefs