



## Teaching resource 2

### An introduction to the Solar System

#### Some basic facts

- The Sun is at the centre of the solar system
- The Earth is one of many planets orbiting the Sun known as satellites to the Sun
- The planets rotate around the Sun in orbits
- The Moon rotates around the Earth and is a satellite of the Earth
- The Sun is the source of light in the solar system
- The planets and Moon are visible because they reflect the light from the Sun
- The sunlight divides the surface of the planets and Moon into a lit side (daytime) and unlit side (night-time)
- The order of the planets starting closest to the sun is: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune. Pluto, is currently classed as a 'plutoid' (see below).

The above can most easily be shown using an orrery – a model named after the Earl of Orrery, who was very interested in models of the planetary system.

#### Pluto and Plutoids

Pluto was demoted from planet status in 2006 and described as a “dwarf planet” until 2008 when its description by the International Astronomical Union was changed to “plutoid” along with Eris, another non-planetary rock that orbits outside Pluto. Whilst the first demotion was widely reported in the press the second name change was not.

#### Topics for discussion

*Do all planets orbit in a flat plane around the Sun?*

Very nearly. The only divergent orbits are those of Mercury, which is set at 7°, and Pluto at 17° to the Earth's orbit. All other planets have orbits set within 3.5° of the plane of the Earth's orbit. This plane is called the Ecliptic.

*What is a year and how long is it?*

A year is defined as the time taken for the Earth to revolve around the Sun, returning to its original position. This takes 365.25 days approximately. As years are by convention and for convenience measured in a whole number of days, years are normally 365 days long with every fourth being 366 – a Leap Year. Further correction every 100 years or so ensures that accumulated errors are kept to a minimum.

*What does the Moon do?*

It revolves around the Earth. It is a satellite of the Earth and is, therefore, a satellite of a satellite.

*How many times does the Moon revolve around the Earth in a year?*

About 12.4 times according to the synodic month which is the period of the moon's phases – this is the time taken for the moon to rotate around the earth to the same position taking into account the fact that the earth is also progressing its orbit around the sun. Hence going around the Earth once takes about one twelfth of a year – this is known as a 'moonth' or month.

*What are the inferior and superior planets?*

Mercury and Venus are inferior planets - that is, they are nearer the Sun than the Earth. The superior planets are those which are further away from the Sun than Earth. They are Mars, Jupiter, Saturn, Uranus and Neptune.

*Is there anything else going around the Sun?*

Yes, there is a miscellaneous collection of bits and pieces called minor planets or asteroids and there are also comets, meteors, and the artificial satellites that men have launched into space.

*How long is the year of a superior planet?*

Because the planet is further from the Sun it takes longer to complete an orbit of the Sun. Jupiter for example takes 11.88 Earth years to orbit the sun.

*Which way do the Earth and the planets revolve around the Sun?*

This depends upon whether you are looking from north or south of the ecliptic. From north of the ecliptic the planets appear to move anticlockwise. Viewed from the south they move clockwise around the sun.

*Does a planet always shine with the same brightness?*

A planet demonstrates 'phases' in the same way as the Earth's moon as the Earth and planets orbit the Sun. As such the illuminated portion of the planet visible from the Earth changes in size as the planet revolves around the sun and so it appears brighter at some times than others.

### Teaching Aids

You can explore all these topics in more detail and set up working illustrations with the following products. Additional activities to support all the above topics and more, together with planetary data, are contained in the comprehensive instruction/activity booklet for the Helios Planetarium.

#### 0156 Orbit Orrery

A basic model showing the relationship between the Sun, planets and the moon. Planets can be rotated by hand around the Sun.

#### 0142 Helios Planetarium: Orrery and Star Dome

An electric orrery for studying the planets and stars. Watch as the planets from Mercury to Saturn orbit the Sun at their correct relative speed while the moon orbits the Earth. An excellent product to show the respective time taken by inferior and superior planets to orbit the Sun.

#### 0149 Solar System Posters

Laminated posters of the Sun and planets printed to scale - each with physical data about the planet. Gives a real feel for the size of the universe.