

## Teacher notes on PowerPoint presentation on current and future space missions

**The Moon**

The European Space Agency (ESA) launched SMART-1 on its Moon mission in September 2003. SMART-1 will take 15 months to reach the Moon, unlike NASA's Apollo missions which took three days. SMART-1 carries cameras to take pictures in visible and infrared light. It will also look for water on the Moon and investigate the composition of rocks on the Moon.

Apollo missions landed on the Moon in 1969, and in the early 1970s. The astronauts brought Moon rocks back to Earth, and studied their composition. They left seismometers on the Moon to measure moonquakes, and the orbiting craft studied anomalies in the gravitational forces

**Mercury**

Mariner 10 flew-by Mercury in 1974; it is the only spacecraft to have been close to this planet. ESA plans to launch the 'BepiColombo' mission in 2011. This craft will have a lander and two orbiting satellites. The mission will take photographs, study Mercury's magnetic field, study rock composition, measure seismic activity and study the effect of the solar wind on Mercury.

**Venus**

ESA's Venus Express will be launched in 2005. It will investigate the planet's atmosphere, including its temperature profile and pressure changes. The experiments will also look at the composition of the atmosphere and the effect of the solar wind on the atmosphere.

**Mars**

Mars Express (ESA) and Beagle2 (UK) were launched on 2 June 2003, and arrived at Mars later that year. They had cameras and equipment to look at the atmosphere and the composition of the Martian surface, and hoped to discover whether water had been present. These two missions also planned to look at the effect of the solar wind. NASA launched two missions to Mars in June 2003, with the Red Rovers 'Spirit' and 'Opportunity'. These have cameras and instruments to look for water and study rock composition. They will also study the climate in the Martian atmosphere.

**Jupiter**

The Galileo spacecraft, launched by NASA in 1989 from the Space Shuttle, circled Jupiter and flew by several of its moons for about eight years. It studied temperatures, the moons' compositions, the dust between the moons and the particles near the moons. Galileo also studied the composition, surface features, and weather of Jupiter itself. NASA has plans to land on Jupiter's moon, Europa, and probe beneath the icy surface.

**Saturn**

The Cassini (NASA) and Huygens (ESA) spacecraft were launched in 1997 and will reach Saturn in 2004. The Huygens craft will land on Saturn's moon, Titan, using a parachute to slow its descent. Huygens will then study the rocks on Titan and look for liquid oceans (possibly methane rather than water). It will also measure seismic activity as well as temperature and pressure changes in the atmosphere. Cassini will examine Saturn's atmosphere, the composition of its rings and the dust particles near Saturn, as well as looking at the effects of the solar wind.

**Asteroids and comets**

Gaspera was photographed by Galileo's camera on its way to Jupiter. The craters on Eros were photographed by the NEAR-Shoemaker satellite, which then landed on the asteroid. Comet Borelly was photographed by the NASA satellite Deep Space -1. Rosetta was launched by ESA in 2004 and will land on a comet in 2014. It will take photographs, study the comet's surface features with radar and look for water. It will also examine rock composition and dust particles as well as looking for magnetic fields. The NASA Deep Impact spacecraft, due for launch in 2004, will travel to comet Tempel-1 and launch a large probe to smash into the comet. It will look at the debris to find the gas and rock composition. Deep Impact will also carry cameras.

**Genesis and Stardust**

Two satellites, launched by NASA, are studying the dust and gas between the planets and near a comet. They have sticky panels which will catch the particles and then return to Earth so that the particles can be analysed in laboratories.