TEACHER RESOURCE

STARDOME OBSERVATORY & PLANETARIUM

FACTS, RESOURCES AND ACTIVITIES ON...

ASTRONOMICAL ORBITS

SCIENCE CONTENT/ CURRICULUM LINK

NIGHT SKY WATCHING, SOLAR SYSTEM, MOON PHASES AND ECLIPSES. PLANET EARTH AND BEYOND – ASTRONOMICAL SYSTEMS. INVESTIGATE THE COMPONENTS OF THE SOLAR SYSTEM, DEVELOPING AN APPRECIATION OF THE DISTANCE BETWEEN THEM.

The formation of our Solar System was a chaotic time with collisions and odd orbital patterns that have since calmed and simplified. Understanding the orbital patterns of the planets in our Solar System is to understand our own planet and the night sky above.

Many astronomical objects have orbits; planets, comets, asteroids, satellites and the International Space Station all have orbital patterns. An astronomical orbit is determined by the gravitational pull of a larger object on a smaller one.

Much like Earth with our Moon, many astronomical objects have their own celestial bodies that orbit them. Jupiter has 67 moons (and counting), and asteroid 2004 BL86 (which just recently whizzed by Earth) has its own moon, making it a binary asteroid.

The effects of orbit patterns can be seen in the night sky, just by observing the Moon. There are a couple of key terms you'll need to teach orbits in class:

Opposition: When astronomical objects occupy opposite sides of the night sky.

Conjunction: When astronomical objects occupy the same part of the night sky.

Apparent Retrograde Motion: When a planet appears to move in the opposite direction as the stars and other planets in our night sky.

> Venus and Mercury are only visible at sunrise or sunset because their orbits are inside of Earth's orbit.

Let's look at Mars, our neighbouring planet. Mars is in opposition or conjunction with the Sun once a year: last year it was in opposition, and this year it will be in conjunction. Mars in opposition occurs when Earth catches up to Mars in their orbits around the Sun, and then Earth leaves Mars behind in the "space dust" (Earth orbits the Sun over 20,000 km/h faster than Mars). When Earth laps Mars in its orbit around the Sun, Mars goes into apparent retrograde motion. When a planet appears to go through retrograde motion, its orbit is not actually changing direction; it just appears that way from Earth's perspective. Viewing Mars in our night sky the planet appears to "turn around", but it won't do this overnight, but over several months.

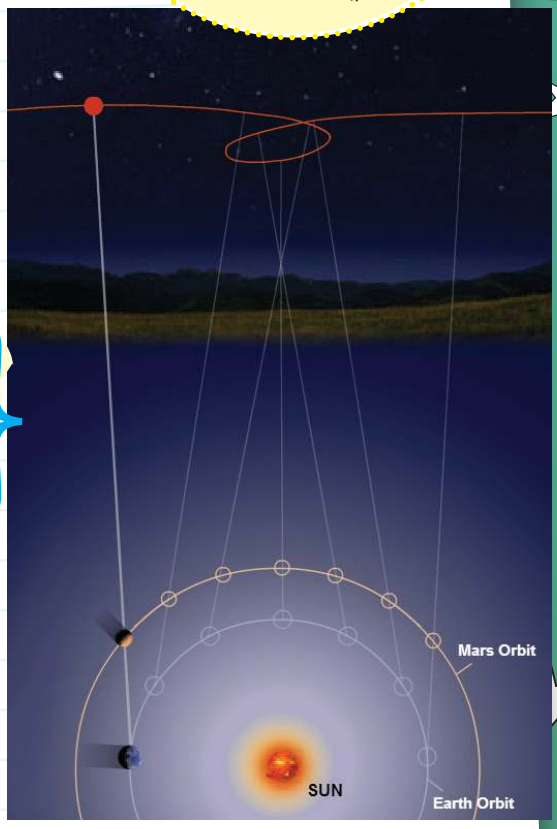

IMAGE CREDIT: NASA

Check out these other resources...

- mars.jpl.nasa.gov/allaboutmars/nightsky/mars-close-approach
- www.jpl.nasa.gov/news/news.php?feature=4459
- **Super Planet Crash:** www.stefanom.org/spc/#

DISCUSSION POINTS

- Will Neptune ever have planets in opposition to the Sun?
- Why do planets appear to change their direction as we track them in the night sky?
- What phase is the Moon in when it is in opposition to the Sun?

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ACTIVITY

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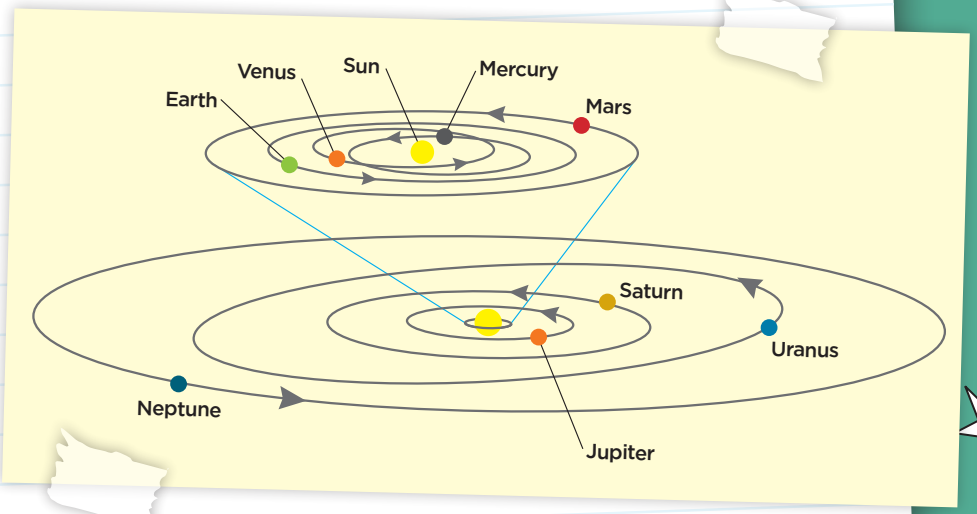
MUSICAL SOLAR SYSTEM

Objective...

Have students recreate the Solar System, and learn how the planets orbit the Sun with a fun game of musical planets.



You'll need...

- Lots of room. This activity takes up a lot of space.
- Eight different coloured balls of wool.
- Something to play music on.

Instructions...

You'll need someone to represent the Sun. In your open space, put them in the centre.

Then assign a ball of wool to eight other children. Unwind the wool in concentric circles to represent the orbits of the planets. Remember to leave a gap between the inner and outer planets for the asteroid belt.

Next, have someone represent each of the planets by standing just outside of the orbit lines. They can begin scattered, or in a planetary alignment.

Begin with the first planet from the Sun, Mercury. This planet not only has the smallest distance to travel, but it also moves the fastest around its orbit, so start by having the student playing Mercury run around the Sun. Then start Venus off just a bit slower at a light run, Earth is slower still, and Mars can be at a steady jog.

Leaving the inner planets and travelling to the outer planets we cut the speeds in half, so Jupiter should be power walking, Saturn at a normal pace, Uranus meandering and finally Neptune taking its good old time.

Now, get the music ready. When the music begins, the students should being their orbits around the Sun. You'll find the music that was sent into Space on Voyager here: http://youtu.be/olLi5RtE_6M

Have the students freeze every time you pause the music and see if you can get them close to an alignment, or if planets can be aligned from other planet's perspective (even though they might be on opposite sides of the Sun). To add an extra level of difficulty, add in the rotations of the planets (Venus is the only planet that will have a clockwise rotation).

Watch the solar system in action here...

- www.solarsystemscope.com

The planets further out from the Sun orbit slower and have farther to go to get around the Sun.

Take a photo of your activity and send it to us. We'd love to see it!
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