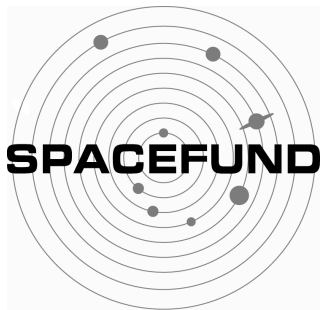
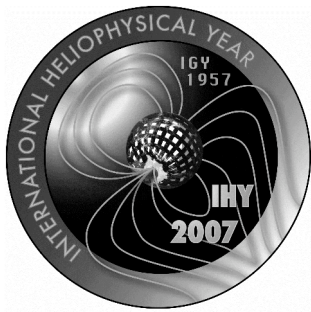

The STFC Further Learning Package

Four fun space-themed activities for Primary Schools

Suitable for KS2 children

The STFC Further Learning Package was designed by Dr. Lucie Green of the Mullard Space Science Laboratory in collaboration with Spacefund and the Science & Technology Facilities Council.

It is a freely available resource to aid the teaching of Primary Science.



What is International Heliophysical year?

International Heliophysical Year (IHY) celebrates 50 years of space exploration and marks the 50th anniversary of International Geophysical Year (IGY). The aim of IGY in 1957 was to understand the Earth's atmosphere and oceans and it required scientists from countries all over the world to co-ordinate their efforts. It was a monumental year which saw the launch of the first artificial satellite, Sputnik 1.

IHY expands the science of IGY out into the entire Solar System!

The aims of IHY are to:

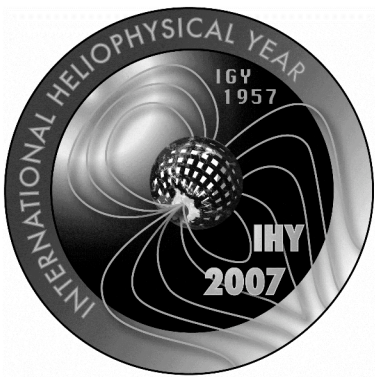
- understand how the planets respond to emissions from the Sun
- study the science of the Solar System
- study how the Sun and the Solar System interact with the space beyond.

For further information please contact:

Lucie Green
lmg@mssl.ucl.ac.uk

or visit

<http://www.sunearthplan.net>



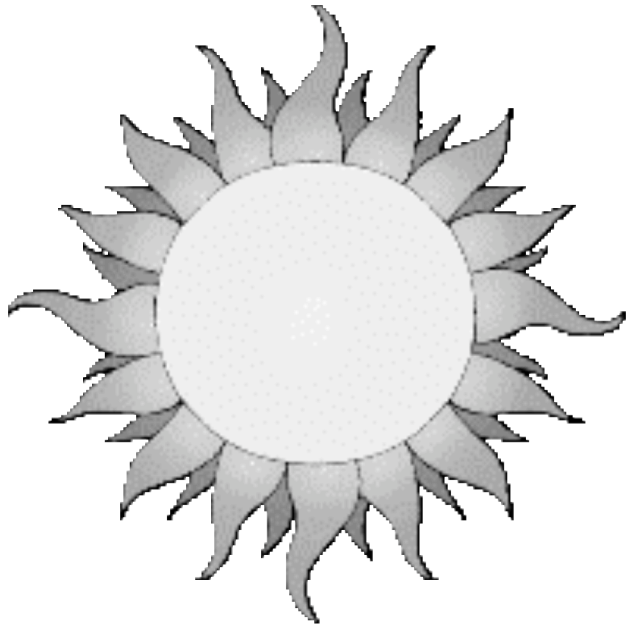
Keeping safe in the Sun

Objectives

- To learn that scientists are studying the Sun during a special year called International Heliophysical Year.
- To learn that the light from the Sun can be dangerous. We need to block this light using suntan lotion.

Resources required

- colour change beads*
- 2-3 different sunscreens
- baby lotion (optional)
- clear plastic bags
- cotton buds
- UV light source (the Sun!)
- stop watch



Teaching activities

Background

2007 is International Heliophysical Year (IHY) and scientists around the world are studying how the Sun affects us here on Earth.

One way the Sun affects us here on Earth is through the ultraviolet (UV) light it emits. The UV from the Sun is what gives you a suntan but it also causes sunburn, which can lead to skin cancer.

This means that when you are out in the Sun you want to take a very good sunscreen to block the UV light, and to keep you safe.

Imagine you're at the beach with your sunscreen but the labels have rubbed off the bottles! Luckily you have some special beads that change colour in ultraviolet light. You decide to create an experiment to test which sunscreen will protect you the best.

Keeping safe in the Sun

Activity

- Put beads into clear plastic bags (the bags represent your skin). Do this out of sunlight.
- Expose bags to sunlight and time how long it takes them to change colour.
- Move the beads out of sunlight and let them return to white.
- Smear a thin layer of sunscreen on the bag. Providing cotton buds for this suggests to the children not to overuse the cream!
- Take time readings for the different creams and lotions to find out which blocks out the sun best!

Safety

NEVER LOOK DIRECTLY AT THE SUN.

The UV beads will change colour outside, even if it is cloudy. However, you may wish to use UV LED torches, or black lights, if you do not have easy access to an outside space.

These should be used with care, not point into eyes, and following any other manufacturer's recommendations.

Students could explore:

- Does glass block UV light?
- Do the different colour beads react in the same way/time?
- How does clothing protect you from UV radiation?
- How long does sunscreen last?
- Try making a colour chart as the beads go deeper in colour.

Web links

*UV colour change beads are easy to source, one suggested provider is

- <http://www.mutr.co.uk> and search for 'UV beads' (approx. £4.00 for 100 beads)

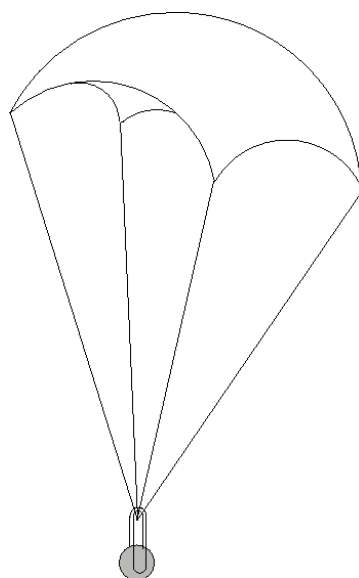
Landing on Mars

Objectives

- To learn that scientists are planning to send a new robotic Rover that will explore the surface of Mars.
- To learn that to land the Rover on Mars they will have to use a parachute.

Resources required

- plastic bag
- 4 pieces of cotton or string
- paper clip
- sellotape
- small toy car
- bubble wrap



Teaching activities

Background

Scientists send robots to explore the surface of Mars to learn about the history of the planet.

In particular, scientists want to learn about the history of water on the Mars; how much was there and when was it there? It is thought that water is crucial for the development of life. If there was water on Mars in its past it might mean that there was also life.

In several decades time it might be possible to send humans to Mars to look for signs of past water and life. Before this, the European Space Agency (ESA) plans to send a Rover to Mars. The mission is called ExoMars and as well as the Rover, ESA will also put a spacecraft in orbit around the planet. British scientists will also work on this mission and will provide cameras for the Rover and other instruments.

It takes about 6 months for a spacecraft to get to Mars. Once there, parachutes are used to bring instruments, like the ESA Mars Rover, slowly down onto the planet's surface. A parachute has a large surface area, which creates a large 'drag' force that slows down the speed that the instrument falls through the planet's atmosphere. Just before touch down, air bags inflate and the Rover bounces before coming to a final halt.



Landing on Mars

Activity

In this activity students make a parachute to land a small toy car (which represents the Mars Rover). Note: Please take sensible precautions when dealing with heights.

1. Cut a plastic bag into a square with sides of 30cm.
2. Cut four pieces of cotton 40cm long, and attach them to each corner of the plastic square using Sellotape.
3. Bring the free ends of the four pieces of cotton together and tie them to the paper clip.
4. Wrap toy car in a single layer of bubble wrap.
5. Attach toy car to the paper clip.

Students could explore:

- What happens to the parachute when dropped from different heights?
- Can you get your Mars Rover to land the right way up?


Web links

For more information about ExoMars see:

- http://www.esa.int/SPECIALS/Aurora/SEM1NVZKQAD_0.html

For a cut-out ExoMars Rover see:

- http://www.esa.int/SPECIALS/Aurora/SEM1RWO4HD_0.html



Cassini-Huygens



Objectives

- To learn about the Cassini-Huygens mission
- To gain an appreciation of just how much space there is between the planets and how far away Saturn is

Resources required

Per group:

- toilet roll with a minimum of 120 sheets
- pens
- distance worksheet
- hall 20 metres in length or the school playing field

Teaching activities

Background

The Cassini-Huygens mission is a mission to the planet Saturn and its biggest moon, Titan.

It is a joint European Space Agency-NASA mission. Cassini is the name of the main spacecraft that is in orbit around Saturn, studying the planet and its beautiful rings, and Huygens is the name of a smaller spacecraft that landed on Titan in 2005. Titan is an interesting moon because it has a thick atmosphere that is thought to be similar to Earth's atmosphere when the planet was very young. The planet Saturn is 1.4 billion km away from the Sun and it took the spacecraft 7 years to get to its destination. British scientists have been involved in the design and build of eight instruments carried by Cassini-Huygens.

The Solar System is a very large place and it is hard to get a feeling of the distances between the planets. In this activity students discover the scale of the Solar System using toilet roll to see just how far away Saturn is (note: this activity does not include the relative sizes of the planets, just their distances from the Sun). It is best to do this activity on a day without too much wind if it is being done outside.

Cassini-Huygens

Activity

The activity should start with a summary of the planets that make up our Solar System; orbiting the Sun at the centre. Then the Cassini-Huygen's mission should be introduced

The planets are (starting with the planet closest to the Sun and moving out):

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto

(Pluto is now officially classed as a 'dwarf planet')

There is a rhyme to help remember the order – **My Very Easy Method Just Set Up Nine Planets**.

Once the students are familiar with the planets they can make the scale model to show just how far apart they are.

Each group of students needs to start by drawing and labelling the Sun on the toilet paper. Do not tear sheets off, but instead unravel the roll. They should carefully draw the Sun on the seam between the first and second sheets. The roll can then be unravelled further and the sheets counted until the correct spacing for the next planet is reached. This planet can then be drawn and labelled. If desired one student can stand at this point to represent the planet. Continue to do this until all the planets have been spaced out.

The distance worksheet provides the information needed to make the correct spacing and the scale is:

1 sheet of toilet paper = 50,000,000 km

Finally, to give the students an idea of how small the planets are in relation to the scale being used they can be told that over 400 Saturns placed side by side would only make up one sheet of toilet paper! Saturn is the second largest planet in the Solar System (Jupiter is the biggest).

Web links

For more information on the Cassini-Huygens mission see:

- <http://saturn.jpl.nasa.gov/home/index.cfm>
- <http://www.esa.int/SPECIALS/Cassini-Huygens/>
- <http://www.ssd.rl.ac.uk/news/cassini>

Cassini-Huygens

Distance worksheet

Planet name	Distance from Sun (km)	Number of sheets of toilet paper from Sun
Mercury	58,000,000	1.1
Venus	108,000,000	2.1
Earth	150,000,000	3.0
Mars	228,000,000	4.5
Jupiter	778,000,000	15.5
Saturn	1,430,000,000	28.6
Uranus	2,871,000,000	57.4
Neptune	4,504,000,000	90.1
Pluto	5,914,000,000	118.3

The Hubble Space Telescope

Objectives

- To learn about the Hubble Space Telescope
- To learn that we split the stars into patterns called constellations
- To make a star chart to find the constellations

Resources required

Per group:

- photocopy of star chart
- photocopy of star chart holder
- an extra sheet of paper or card to create a backing to the star chart holder
- scissors
- sellotape
- stapler may also be needed

Teaching activities

Background

The Hubble Space Telescope is a telescope that floats in space. It was built by the European Space Agency and NASA.

This telescope was launched in 1990 and is in orbit around the Earth. British scientists have worked on the instruments that are carried onboard the Hubble Space Telescope and study the images that the telescope takes.

During its time in space Hubble has looked at the planets in our own Solar System, including when a comet broke into pieces and then crashed into Jupiter. Hubble has also looked at stars in our own Galaxy and even found planets orbiting around these stars. When stars die they can die in a spectacular explosion called a supernova. Hubble has taken images of lots of these supernova events. One of the most important things that Hubble has done is help astronomers work out the age of the Universe. It did this by measuring the distance to lots of galaxies and then using an equation by Edwin Hubble; after whom the telescope was named!

The Hubble Space Telescope

Thanks to the Hubble Space Telescope we now think that the Universe is an amazing 13.7 billion years old! When the telescope was turned to look at far away galaxies it also found that massive black holes lurk in their centres eating up any material that comes near them.

Activity

The activity should start with a brief introduction to the Hubble Space Telescope. Explain that this telescope takes pictures of many objects in the night sky including stars. Astronomers catalogue stars and split them into patterns, called the constellations. The constellations that we know today were actually named by the ancient Greeks. Today, the constellations enable astronomers to find their way quickly around the sky.

In this activity students will make a simple star chart (also called a 'planesphere') which will show them what constellations are visible on each night of the year. There are three pieces to the chart; the map of the stars and the front and back of the holder. The two pieces of the holder need to be glued or stapled together.

- Cut out the circular star chart and glue it to a piece of cardboard (or photocopy onto card and then cut out).
- Cut out the front piece of the star chart holder, cutting around the outside and the oval centre where indicated. Now fold the flaps behind.
- Making sure the flaps are folded behind draw around the holder on the paper or card and then cut it out to create a backing. Glue or staple it to the flaps on the front piece (so that you have a made a pocket).
- Place the star chart in the pocket and make sure it can be rotated around.
- Rotate the star chart so that the current month and day on the star chart line up with the time on the holder.
- The children can take this home with them – ask them to try and find the constellation Cassiopeia (it's shaped like a big 'W').

Web links

The star char is taken from:

http://www.nrc-cnrc.gc.ca/education/skies/cs-planisphere_e.html

To see images taken by the Hubble Space Telescope go to:

<http://hubblesite.org/gallery/>

The Hubble Space Telescope

Star chart



The Hubble Space Telescope

Star chart holder (front piece)

