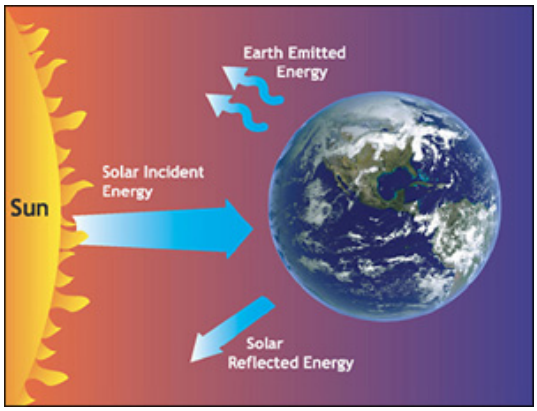
Activity 3: Make your own greenhouse

In this activity, students will build and investigate their own greenhouse.

Background information

Think about a patch of dirt in the open Sun. As the Sun warms the dirt, the temperature increases, and the dirt releases heat and moisture into the atmosphere. Gardeners use greenhouses made of glass to trap heat and moisture inside, keeping temperature and humidity levels higher inside than outside, helping plants to grow.

Without the layers of the Earth's atmosphere to create a similar greenhouse effect, all the heat from the Sun would simply be reflected back into space and lost. The greenhouse effect is essential for life on Earth; however, certain chemicals called greenhouse gases can change the thickness and composition of our atmosphere, which can affect how much heat is trapped.



CREDIT: NASA

Venus has a thick atmosphere, with large amounts of sulphur and carbon dioxide. This means that Venus has a much stronger greenhouse effect than Earth. The surface of Venus is over 400°C and the air pressure is 90 times that of Earth.

The colour of a planet (its albedo) can also affect the greenhouse effect. Lighter colours are better at reflecting heat. Darker colours absorb more heat.

In this activity your students will model a greenhouse environment. They will use cling film (to simulate the Earth's atmosphere) and bubble wrap (to simulate the effect of a thicker atmosphere, like Venus) to compare the difference in temperature between these environments.

What you need

Each group will need:

- A copy of the *Record Keeping* Worksheet (page 22)
- A medium clear glass jar or plastic bottle
- Cling wrap to cover the jar or bottle
- Bubble wrap to cover the jar or bottle
- Small thermometer (must fit inside the jar)
- Damp dirt (enough to cover the bottom of the jar three times)
- Rubber band
- Graph paper

What to do

1. Ask the students what they understand about the terms greenhouse and greenhouse effect. Have they ever been inside a greenhouse?
2. Divide the students into small groups of around three or four. Give each group a set of activity materials. Each group steps through the following procedure:
    a. Place a small layer of dirt on the bottom of the jar.
    b. Place the thermometer into the dirt and place in the sun.
    c. Record the temperature every minute for 10 minutes. Record the temperature on the table provided in the *Record Keeping Worksheet*.
    d. Replace the dirt in the jar.
    e. Cover the top of the jar with the cling wrap and secure with a rubber band.
    f. Repeat step c.
    g. Remove the cling wrap and replace the dirt again.
    h. Cover the top of the jar with the bubble wrap and secure with a rubber band.
    i. Repeat step c.
3. Using graph paper, plot the temperature versus time for each model. Use different colours and label each model so you can tell them apart.

Questions

1. In which situation did the temperature increase fastest: open air, cling wrap or bubble wrap? Is this what you expected?
2. Why do the covered jars become hotter? How is this similar to the greenhouse effect on Earth?
3. Venus' atmosphere is much thicker than that of Earth. Would you expect it to be hotter? Why?

Extension (Optional)

Carbon dioxide is one of the most important greenhouse gases. Have students research the main parts of the carbon cycle online. Some good resources are:

Carbon cycle interactive games:
http://www.windows.ucar.edu/earth/climate/carbon_cycle.html
http://epa.gov/climatechange/kids/carbon_cycle_version2.html

Articles:
http://www.eo.ucar.edu/kids/green/cycles6.htm
http://earthobservatory.nasa.gov/Features/CarbonCycle/carbon_cycle4.php

After researching the carbon cycle, ask students to write a short story entitled 'A day in the life of a carbon atom'. Their story should discuss what happens at key points in the carbon cycle.

Worksheet – Record Keeping

Greenhouse Type	Time (min)	Temperature (°C)	Greenhouse Type	Time (min)	Temperature (°C)	Greenhouse Type	Time (min)	Temperature (°C)
Open	0		**Cling Wrap**	0		**Bubble Wrap**	0	
Open	1		**Cling Wrap**	1		**Bubble Wrap**	1	
Open	2		**Cling Wrap**	2		**Bubble Wrap**	2	
Open	3		**Cling Wrap**	3		**Bubble Wrap**	3	
Open	4		**Cling Wrap**	4		**Bubble Wrap**	4	
Open	5		**Cling Wrap**	5		**Bubble Wrap**	5	
Open	6		**Cling Wrap**	6		**Bubble Wrap**	6	
Open	7		**Cling Wrap**	7		**Bubble Wrap**	7	
Open	8		**Cling Wrap**	8		**Bubble Wrap**	8	
Open	9		**Cling Wrap**	9		**Bubble Wrap**	9	
Open	10		**Cling Wrap**	10		**Bubble Wrap**	10	