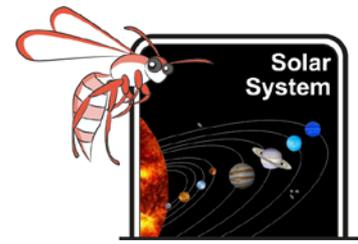


## What If... – Teacher Notes



These questions can be used to encourage student groups to think deeply and creatively about our solar system and how it works. Give students one of the scenarios below for 5 minutes and ask them to consider what might happen based on their knowledge of space science. Ask them to suggest at least two effects the change might cause, and share with the class.

In this activity, try to think creatively and deeply about space science. For each 'what if' scenario, think about what have you already learnt that is relevant to the idea and what might cause the scenario. Then dream up some effects the scenario might have on Earth or the solar system.

### **Scenario 1: ... the Earth stopped spinning?**

Earth's rotation originated from the spinning disc of dust from which the solar system formed. The rotation of Earth is actually slowing, but thankfully not very quickly. Rotation moves the air, which causes winds, which are critical to climate and weather systems. The Earth is an oblate spheroid (slightly squashed sphere). Rotation has caused it to slowly develop a bulge out at the equator.



There would be no more day and night causing intolerable heat on the side facing towards the Sun and extreme cold on the dark side

Water would move away from the equator towards the poles leaving a belt of dry land.

### **Scenario 2: .... the Earth or one of the other planets suddenly disappeared?**

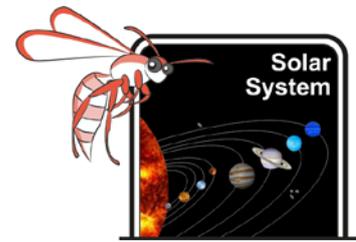
Loss of the Earth would have hardly any effect on other planets or the Sun because it has relatively little mass and gravitational pull.

The moon would be pulled towards the Sun.

Even if one of the larger planets like Jupiter disappeared, although it has 300 times the mass of Earth, compared to the Sun, it would have minor effect on the other planets. Jupiter's moons would probably be pulled towards the Sun by its gravity and there might be a very slight adjustment in the orbital paths of neighbouring planets, such as Saturn.



## What If... – Teacher Notes



### Scenario 3: ... planets such as Earth were stopped in their orbit?

The orbits of planets are controlled by the forward movement of the planet and the gravitational pull of the Sun. As the planet approaches the Sun, its speed increases; and as it moves away, its speed decreases. These two factors produce elliptical orbits. If the planets stopped orbiting they would be pulled into the Sun by its gravity. Movement would be initially slow but would speed up the closer it got to the Sun.

The Earth would have about 64.5 days before Sun-strike and obliteration. In half that time, most living things would have died from the heat.

The planet would progressively cross the orbits of Venus and Mercury.



### Scenario 4: ... Earth lost its atmosphere?



We are actually very slowly losing molecules from the outer edge of our atmosphere to space. Approximately 3kg of hydrogen gas and 50g of helium gas are lost each second. The pull of our gravitational mass and our magnetosphere protecting us from solar winds prevents more loss. Without an atmosphere, Earth's sky would appear black. (The sky on the Moon where there is no atmosphere is black). Its blue colour is the result of sunlight refracted (bent) on its passage through the atmosphere.

There would be silence. Sound needs air to travel through.

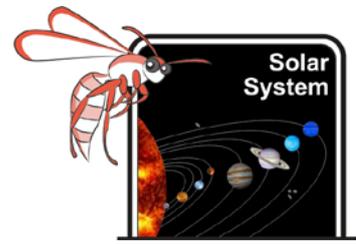
The atmosphere would no longer be there to minimize the effects of solar radiation. The surface would become very hot.

The ozone layer would no longer minimise the entry of harmful UV radiation and mutations would occur.

Many plants and animals would die.

Water would evaporate from the oceans and lakes and this vapor would make the surface hotter (i.e., an enhanced greenhouse effect like on Venus).

## What If... – Teacher Notes



**Scenario 5: ... if we found another Earth-like planet circling another star? Should we try and contact any life on the planet? If so, what information should we send?**

In 1974 the new Arecibo radio telescope in Puerto Rico sent a digital radio message to the star cluster M13, in the hope of contacting extra-terrestrial intelligence. It contained basic information about humans and our location in our solar system.

This graphic to the right is the message that was sent out into space.

**What do you think the scientists wanted alien life to interpret from it?**

(Hint: There are seven main ideas)

- A. The numbers 1 to 10 in binary.
- B. The atomic numbers of the elements that make up DNA on which human life is based.
- C. The formulae of the chemicals that make up DNA.
- D. A graphic picture of a human.
- E. The number of humans alive at that time.
- F. A graphic picture of our solar system indicating which planet the message had been sent from.
- G. A graphic picture of the Arecibo radio telescope.



**Can you think of two good reasons why we would want to give this information to alien life forms?**

They would have a good idea of the type of life we were and how advanced (or not) we are.

**Can you think of two reasons why we would not want to give this information to alien life forms?**

They might want all our resources. They might enslave us. They might bring diseases.