Down to Earth
KS3

Teacher Guide

Comets and the Deep Impact Mission

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Comets and the Deep Impact mission

Aims

This assembly aims to introduce the NASA Deep Impact mission which crashed a spacecraft into a comet to create a massive crater, on July 4th 2005.

This assembly aims to:

- Show them what a comet is.
- Show why it is important to study comets.

Resources Required

- Black bin bags
- newspaper
- paper towels
- large mixing bowl
- wooden rolling pin
- wooden mixing spoon
- safety goggles
- insulated and waterproof gloves
- 3 pints of water
- handful of sand
- window cleaner
- Worcestershire sauce
- handful of crushed charcoal
- large bowl full of crushed frozen carbon dioxide

Other Useful equipment:

- Laptop
- projector
- microphone

Introduction

Introduce the Deep Impact mission, mention the Hollywood films related to comets and asteroids and how they are normally portrayed as being a threat to the Earth. This mission was about understanding comets, not about deflecting a comet that might hit the Earth!

Ask if any student has seen a comet?

Display image of comet

'NASA sent a mission to a comet which arrived on July 4th 2005. They wanted to understand further what a comet is made of as we had never before been able to see inside them. However, scientists did have some idea of what comets are made of and I'll show you that now.'

Main presentation

Make a frozen carbon dioxide comet at the front of the hall and discuss the process. Have all the ingredients and utensils you need in front of you on a table. All the students need to see what you are doing.

- Place a bin bag in the mixing bowl and open it, folding over the edge of the bowl.

'I am going to make a comet in this bowl! Comets contain lots of water so I am going to start off by adding water to my mixing bowl.

- Poor about 1-2 pints of water into the bag (don't be afraid of adding too much. When the water freezes it holds all the ingredients together).

'Scientists have found that comets contain dust. However, this is not like the dust found in your homes which is bits of hair and skin, but silicate dust and to represent this I am going to add some sand.'

- Add the sand into the bag and stir well.
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'Ammonia is also present in comets and to represent this I am going to add window cleaner.'

- Squirt some window cleaner into the bag and stir well.

'Next to go into my comet is Worcestershire sauce as they contain organic materials. That is they contain materials made of carbon.'

- Add a few dashes of the sauce and mix again.

But I am also going to add some crushed charcoal to which is pure carbon.

- Add a few teaspoons of crushed charcoal.

'Now, my comet also contains carbon dioxide and is extremely cold as it spends most of its life far out in the depths of the Solar System away from the energy of the Sun. So I am now going to add frozen carbon dioxide, which is also known as dry ice. It is at a temperature of -79 degrees C.

As the frozen carbon dioxide is so cold it can actually burn me. So I am going to wear protective goggles and gloves.'

- Put on the protective gloves and goggles. Place the dry ice in a pillow case inside a bin bag and holding the end closed smash the dry ice with a wooden rolling pin. The dry ice needs to be in small pieces.

'Now I am going to add the smashed up dry to the rest of the ingredients.'

- Poor the dry ice into the bin bag in the bowl and stir vigorously! Then fold over the top of the bin bag and press down on to the comet to get all the materials to stick together in one big lump. If things aren't sticking together add some more water and press down again. KEEP THE PROTECTIVE GLOVES ON!

'Now, everything appears to have frozen together and I can reveal my comet!'

- When the comet is sufficiently frozen together, unwrap it and hold it up for the students to see.

'You can see that the outside of the comet is black and this is just what we think real comets are like. They are the darkest objects in the Solar System. But on the inside we suspect they might be quite light and reflective. The Deep Impact mission will tell us if this is really the case.

Comets spend most of their time in the far reaches of the Solar System where they do not change with time. However, they go around the Sun in very eccentric orbits and when they come close to the Sun they start to heat up.

Show image of comet's path through the Solar System

When they heat up the frozen gasses start to sublime and turn into gas form. The gasses come out as jets and the comet starts to crack and fizzle.

- If you have a microphone in the school hall hold the comet next to it. You will hear it pop and crackle as the frozen carbon dioxide turns from a solid to a gas.

'We only see comets when they come close to the Sun and the frozen gasses and particles are released as the Sun's energy heats the comet up. These particles then reflect sunlight and allow us to see the comet.'

Summary

‘This comet is somewhat smaller than the real things which are several miles across in size! The comet which was hit in the Deep Impact mission was almost 6 miles across. They can be thought of as dirty icebergs rather then snowballs!

Additional notes

Once the comet has been made it should be disposed of carefully. It can be left to melt and for the carbon dioxide to sublime (turn into a gas) in an open space away from students.

Extension/shortening tip

To shorten:

- Remove detailed discussion on what comets are made of.

To lengthen:

- Include PowerPoint presentation images of comets.

Recommended resources

The Deep Impact website
- http://deepimpact.jpl.nasa.gov/

The Nine Planets website
- http://www.nineplanets.org/