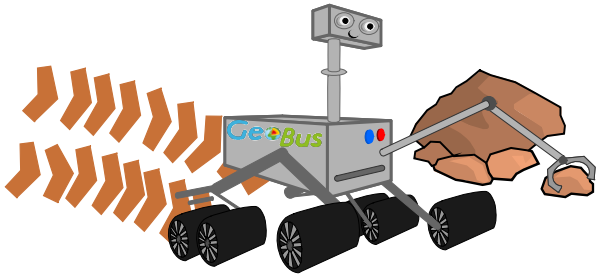
The Martian

Science Fact or Science Fiction?



Materials: Copy of *The Martian* on DVD, materials for supporting experiments/activities if using

Background: Perhaps surprisingly, compared to many other space themed movies, *The Martian* is actually quite accurate with only a few points which are completely untrue. In this activity, selected clips of scientific importance/key situations are used as the base for a discussion on the accuracy of science in popular films.

This can either be carried out as a simple class discussion around the selected scientific elements of the film, or can be combined with the more in-depth activities/experiments in the 'Science Fact or Science Fiction' pack. The clips have been chosen to make sense even when viewed individually, but it may help to read out a short description of the film plot for anyone who hasn't seen it (or ask a pupil who has to give an overall description).

When a group of astronauts blast off from Mars, they leave behind Mark Watney, presumed dead after a fierce storm. With only a small amount of supplies, he must use his wits, knowledge and spirit to find a way to survive – hoping someone will realise he is still alive and come back for him!

Time: Dependant on activities incorporated – to show all movie clips and work through explanations given takes **approx. 35-40mins**

Instructions: Clips from the film are given as times (hh:mm:ss), the corresponding 'chapter' (some as log entries) in the book is also given – please note that it contains some bad language.

After watching each clip, get the pupils to discuss and vote whether the depiction is realistic or not (either as a class, or encourage pupils to discuss in small groups and decide how the 'team' will vote)

The downloadable powerpoint 'The Martian: Science Fact or Science' gives the answer and explanation for each clip

The Storm 00:03:53 – 00:04:54 LOG ENTRY: SOL 6

Science FICTION: the strength of the storm is not realistic - you do get dust storms on Mars but they are not this strong. The Martian atmosphere is only 1% as thick as Earth's, so a Mars wind of 100mph - possible although quite rare on the surface - would only have the same force as a 10mph wind on Earth.

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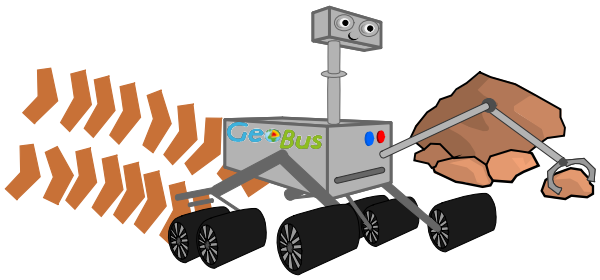

Surviving on Potatoes 00:20:38 – 00:21:34 LOG ENTRY: SOL 26

Science FACT: potatoes are pretty high in almost all minerals, vitamins, and macronutrients the human body needs to survive. As part of an experiment, one man survived on nothing but potatoes for 60days. He was eating 15-20 potatoes (2000cals) a day compared to the 1 (162cals) Mark eats in the film – but gravity is less strong on Mars so Mark would be using less energy AND he was supplementing his potatoes with rationed freeze dried food … so he might have been able to survive.

Fertiliser 00:23:24 – 00:24:17 LOG ENTRY: SOL 14

Science FACT: Human and animal waste has been used as a fertiliser on Earth throughout history, although bio soils today are heavily treated. This is because every human carries pathogens that can cause illness (viruses, bacteria, parasites) which could be transferred into the plants.

Making water 00:24:37 – 00:28:00 LOG ENTRY: SOL 30

Science FACT: Mark Watney took hydrazine from the rocket fuel and split it into nitrogen and hydrogen, which is possible, then burned the hydrogen with oxygen to make water. However, scientists have said that if they were stranded on Mars they would simply extract water from the ground: on Mars water can be found as ice, permafrost or contained within the soil.

Growing plants 00:28:34 – 00:28:56 LOG ENTRY: SOL 26

With the addition of fertiliser it really would be possible to grow potatoes in Martian soil. However, wet chemical analysis of the soil on the surface of Mars has shown it to be 0.6% perchlorates (salts capable of disrupting the body's metabolic system) so you'd have to take care.

Gravity Assist 01:23:33 – 01:25:05 (Chapter 16)

Michael Minovitch - a trajectory analyst at NASA's Jet Propulsion Laboratory in 1960s - came up with the idea of the gravity assist that became the basis of the Voyager programme to Jupiter, Saturn, Uranus and Neptune. Minovitch literally had to get out the chalk and walk them through the theory to convince them that it would work – just like the character in the movie.

Window-less launch 01:45:08 – 01:45:50 LOG ENTRY: SOL 549

The atmosphere is very thin, so can you get high enough that the atmosphere becomes irrelevant, before you're going fast enough that it would matter. It depends on the thrust profile (acceleration and speed), but lots of mathematics proves it is possible … if scary!

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