

For 7 to 11 year olds

Context

Robots can do wonderful things but only when programmed to do so. They can land, explore new terrain and collect samples. Robots help astronauts and scientists to safely gather information that can then help to prepare astronauts for space missions. The European Space Agency's (ESA) new robotic rover Rosalind Franklin will explore Mars and send back data vital for human exploration in the future.

In this activity, the children are introduced to robots, the kind of things that they can do and how they can help humans. They learn about the robots being used by astronauts on the International Space Station (ISS) and on missions to Mars and design and make a robotic arm.

Alien Tripod Illustration

HG Wells' War Of The Worlds

Illustrator – Alvim Corrêa

**Resources**

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|---------------------------|----------------------|
| • Activity sheet 1, 1a | • Brass fasteners |
| • Litter grabber | • Sticky tape |
| • Tongs | • Straws |
| • Articulated arm to demo | • Smooth thin string |
| • Corrugated cardboard | • Paper clips |
| | • Hole punch |
| | • Disposable cup |

National curriculum links**Design technology:**

- Investigate existing products
- Generate ideas through discussion
- Select and use suitable materials and give reasons for their choice

Science:

- Know that the arm is an example of a lever

Lesson starter

HG Wells wrote an exciting science fiction book called 'War of the Worlds' published in 1897 about an invasion by Martians attacking Earth. The Tripod (en.wikipedia.org/wiki/File:War-of-the-worlds-tripod.jpg) was a fighting machine used by the Martians; it moves on three tall articulated legs, and has tentacle-like arms under its body with a hood-like head.

To set the scene, play a musical clip, 'The Eve Of The War' by Jeff Wayne: www.youtube.com/watch?v=MyRWL_1baMA and read the text from Activity sheet 1. What is the difference between a machine and a robot? Can you think of any examples of robots?

Scientists are sending robots to Mars; they can explore and send lots of information about the Red Planet. Robots are machines that need to be controlled by computers. Rovers with robotic arms have been sent to Mars and the International Space Station (ISS) has a robotic arm that helps astronauts do difficult tasks. Astronauts have to train very hard to learn how to use it. Show: www.youtube.com/watch?v=zbwV0fs-xU&feature=youtu.be

Main activity

Refer to the support notes for instructions for making a cardboard arm and hand. How is a robotic arm like a real arm? Both have flexible parts and rigid parts and they have joints or connections. Think about how your arms move. Muscles pull on bones. The elbow is a joint where the lower arm connects to the upper arm. It is an example of a lever. Show the tongs and litter grabber, also examples of levers.

Today you are going to be engineers, designing a robotic arm and hand to pick up a cup. There are lots of different materials that you can use but first you need to think about what your device will look like and how it will work.

Show the materials. Which of these materials could be bones, muscles and joints? The children discuss ideas and draw initial designs, before making a prototype for testing. (You might wish to demonstrate the model shown in the Support notes, showing how the string acts as muscle pulling the cardboard bones, the straws act as tendons to guide the strings, and the joint is the paper fastener.) Can they use their robotic arm to pick up a disposable cup? (Try attaching a paper clip hook to the hand and a handle on the cup!)



Plenary

The groups demonstrate their models. Did they have any problems? How did they adapt their models? How could they improve them?

Explain that engineers must test their ideas many times, solving problems before a final model is made.

Discuss:

- Why do engineers design robots?
- How might robots help astronauts in the future?
- How might they be useful if humans want to live on Mars?
- Do they think robots might be found on Mars?
- What might they look like?

Today's robots have sensors and are able to make their own decisions. Robots come in all shapes and sizes. Artificial intelligence (AI) allows robots to behave more like human beings and to act independently.

Further activities

- Improve your robotic arm by adding another section or modify it so the hand can grip something. Try making the articulated hand attached to a tube as shown in the support notes.
- Research types of robots. Design and build a model and add information labels. Add wires, a battery and bulbs for eyes! Light up your robot.
- If an alien is coming from Mars, can you find out more about this planet? This might help us to think about what this alien will look like, think like and be like
- What might Mars look like? What might Mars feel like? What might Mars smell like?

STEM Vocabulary

Robot	Rigid
Programming	Lever
Control	Joints
Flexible	Muscles

Journalist: No one would have believed, in the last years of the nineteenth century, that human affairs were being watched from the timeless worlds of space.

No one could have dreamed we were being scrutinised, as someone with a microscope studies creatures that swarm and multiply in a drop of water. Few men even considered the possibility of life on other planets and yet, across the gulf of space, minds immeasurably superior to ours regarded this Earth with envious eyes, and slowly and surely, they drew their plans against us.

At midnight on the twelfth of August, a huge mass of luminous gas erupted from Mars and sped towards Earth. Across two hundred million miles of void, invisibly hurtling towards us, came the first missiles that were to bring so much calamity to Earth. As I watched, there was another jet of gas. It was another missile, starting on its way.

And that's how it was for the next ten nights. A flare, spurting out from Mars – bright green, drawing a green mist behind it – a beautiful, but somehow disturbing sight. Ogilvy, the astronomer, assured me we were in no danger. He was convinced there could be no living things on that remote, forbidding planet.

“The chances of anything coming from Mars are a million to one,” he said.

“The chances of anything coming from Mars are a million to one – but still they come!”

