science
FICTION
science
FUTURE

SCHOOL AND VISITORS GUIDE

Contents

EXHIBITION OVERVIEW

Science Fiction, Science Future allows visitors to move objects with their mind, turn invisible, be mimicked by a robot and see augmented reality in action.

Are you ready for science fiction to become a reality...?

This visually compelling exhibition provides opportunities for creativity and innovation on a large scale. Engaging exhibits enable visitors to develop a deeper understanding of how science fiction ideas and concepts might become the science reality of tomorrow.

Science Fiction, Science Future engages visitors with exciting hands-on and full-body experiences incorporating robots, invisibility, mind control, holograms and augmented reality.

High impact graphic panels have been designed to explore science principles in everyday terms. They convey information on medical technology, communication and transport and include links to science fiction films and pop-culture references.

With interactive, engaging exhibits that challenge the mind and body, and a stunning visual environment, this exhibition sets the stage for a unique journey of science exploration, curiosity and discovery.

Key messages

Just like science fiction stories, curiosity, innovation and imagination underpin many scientific principles. This exhibition incorporates these notions to bring to life many innovations and inventions that were once considered only possible in film and literature.

The exhibition gives visitors the opportunity to practice science literacy skills, including:

- predicting, imagining, thinking critically, being curious and assessing fictions versus fact; and,

- developing positive attitudes to science and scientists, being aware of the positive role of science in society, and being able to engage in social or political debates related to science
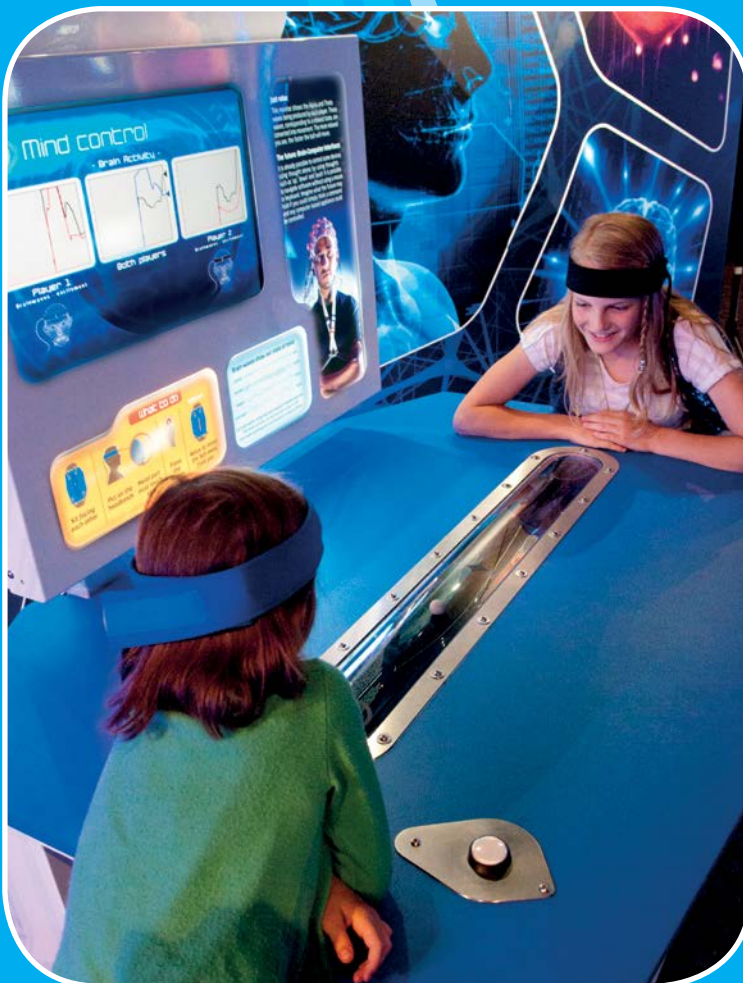
Hey, that robot's copying me

Robots are no longer just industrial machines but can now have social applications. Interact with this robot and see it analyse your emotions and mimic them.

Science Links: Robotics, Biology

Mind control

Sensors can measure a huge range of things about our bodies, including our state of relaxation. Using this engaging exhibit, visitors compete against one another to see who can move a ball using only their brain waves.

Science Links: Neurobiology and Neuroscience

Beam me up

Imagine if teleportation could really be the transport of the future. Enter this exhibit and give your family and friends the illusion of being beamed out and back again.

Science Links: Science in Society, Technology and Innovation, Special Effects

Invisible me

Cloaking features heavily in science fiction movies, either as personal invisibility cloaks or a method for making entire spaceships undetectable. Visitors interacting with this exhibit can see how all or part of them can become 'cloaked' as they watch themselves disappear on screen.
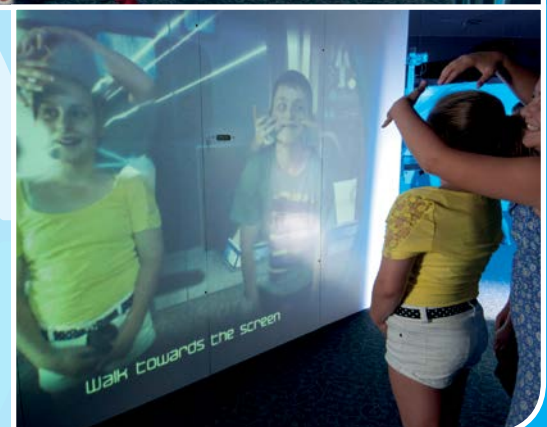
Science Links: Science in Society, Technology and Innovation, Special Effects
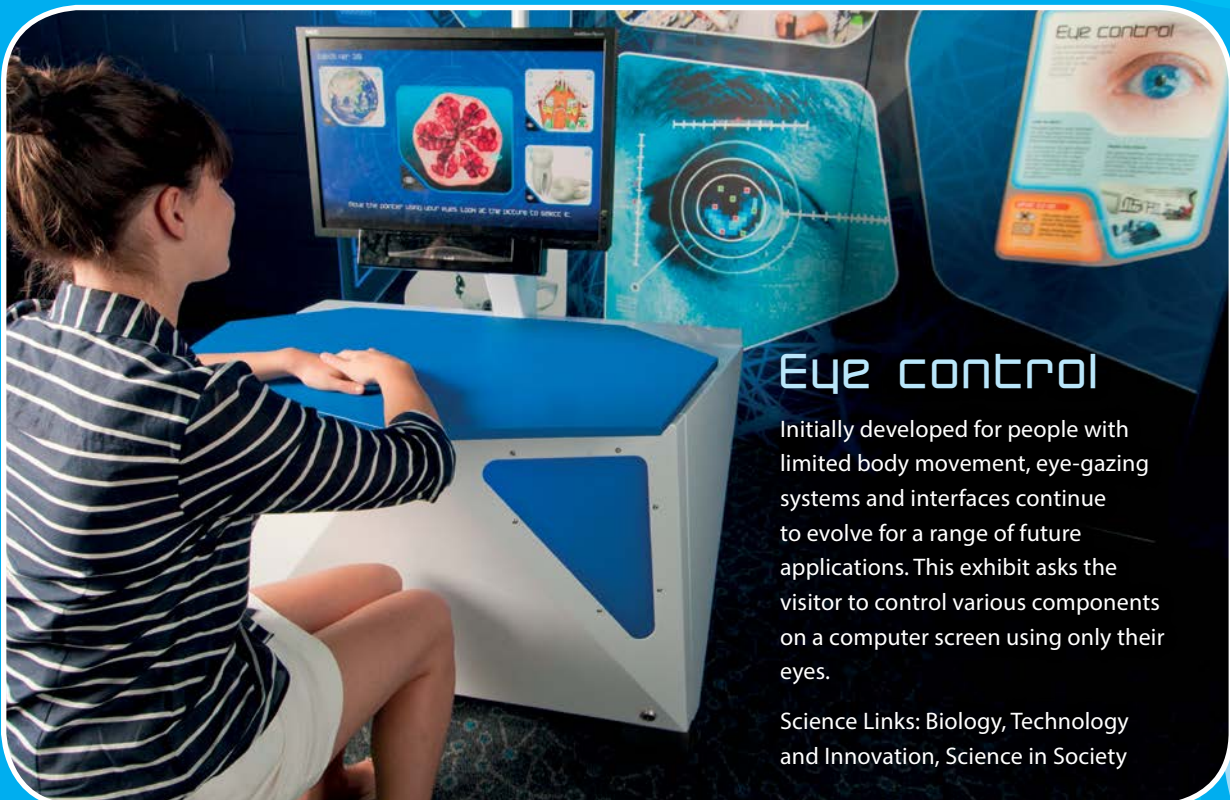
Augmented reality wristbands

Using advanced augmented reality technology, visitors can scan a special wristband and see a virtual 3D avatar appear on screen that reveals information about their DNA, medical condition and possible future career.

Science Links: Biology, Technology and Innovation, Ethics of Science

Eye control

Initially developed for people with limited body movement, eye-gazing systems and interfaces continue to evolve for a range of future applications. This exhibit asks the visitor to control various components on a computer screen using only their eyes.

Science Links: Biology, Technology and Innovation, Science in Society

Projection ball

Within the centre of this exhibition, this giant inflatable sphere features a continuous montage of futuristic images and videos projected onto a unique dome surface.

Science Links: Technology and Innovation, Science in Society

Design a cyborg

This entertaining exhibit allows visitors to create a customised cyborg of the future. A range of organic and synthetic parts are available to create this augmented reality robotic friend.

Science Links: Technology and Innovation

Future past

This exhibit takes a look at the visions people had of the future from the 1890s to the present day. Did they get it right?

Science Links: Science in Society, Technology and Innovation

Medibioscan 3000

Medical scans are integral in revealing information about our body systems. As this technology evolves we predict it will provide more information and even be able to treat diseases non-invasively. Visitors can enter the Medibioscan 3000 and see what it reveals about their internal body.

Science Links: Biology, Technology and Innovation

Choose your future

This quiz-like kiosk puts the visitor in the hot seat and challenges them with ethical dilemmas they may be faced with in the future, such as eating in-vitro meat and wearing an identity chip. A running tally shows each visitor how their answers compare with previous visitor data.

Science Links: Ethics of Science, Science in Society

Draw your future

This exhibit encourages visitors to draw what they think the future might be like and then add their drawing to a wall featuring a collage of other visitor predictions.

Science Links: Technology and Innovation

A holographic future

Imagine having a 3D hologram appear out of a mobile phone. This exhibit explores how we might communicate through holograms in the future.

Science Links: Science in Society, Technology and Innovation, Physics

Wormholes through space

Some scientists believe it could be possible to journey through space and time by travelling through a wormhole. This exhibit reveals what a wormhole is and how we could travel through one.

Science Links: Physics, Technology and Innovation

Our quantum future

A classic demonstration of light that underpins quantum physics and explores its links to the possibilities of transporter technology.

Science Links: Physics, Technology and Innovation

Research questions, ages 4 – 8

Technology is anything that humans make which helps us to do things. Phones and computers are examples of technology, but so are paper and the wheel. What new technologies might there be in the future?

There are lots of ideas in the *Science Fiction Science Future* exhibition - maybe you might help invent one of them!
To answer the questions on this worksheet, find each pictured exhibit and have a go.
You might need to read the graphics panels for clues too.
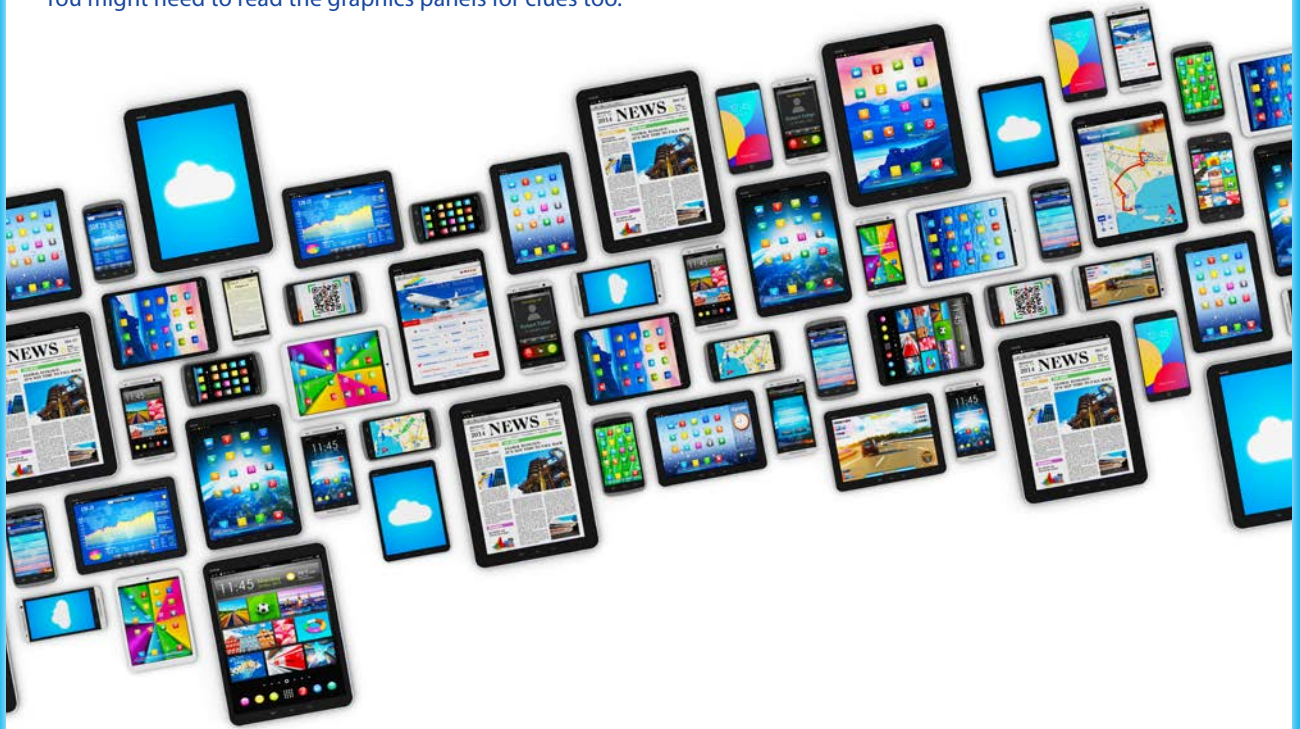
Plasma Propulsion:

Question 1. What is propelling the rotor? _____

Hey, that robot's copying me:

Question 2. Name two ways robots are already being used

1. _____

2. _____

Choose Your Future:

Question 3. Which question did you find easy to answer? _____

_____

Question 4. Which question was hard to answer? _____

_____

Research questions, ages 4 – 8

Future Past:

Question 5. Which year features a:

- Piano playing robot?_____

- A robot which vacuums the floor with its feet?_____

- Personal wings? _____

Mind Control:

Question 6. Which type of brain wave do you have when you are most relaxed?

_____

Beam Me Up:

Question 7. Have scientists ever managed to teleport something? _____

What was it? _____

Question 8. Can this technology be used on humans? _____

Did you know?

Jules Verne was one of the first science fiction writers – around the end of the 19th century. He wrote about several pieces of technology that were later invented, including the submarine and the solar sail.

Research answers, ages 4 – 8

Plasma Propulsion:

Question 1. What is propelling the rotor?

Plasma, lightning or electricity are all acceptable answers.

Hey, that robot's copying me:

Question 2. Name two ways robots are already being use

Robot pets for the elderly, assisting surgeons.

Choose Your Future:

Question 3. Which question did you find easy to answer?

Student's choice.

Question 4. Which question was hard to answer?

Student's choice.

Future Past:

Question 5. Which year features a:

- Piano playing robot? *1980*
- A robot which vacuums the floor with its feet? *1940*
- Personal wings? *1890*

Mind Control:

Question 6. Which type of brain wave do you have when you are most relaxed?

Delta waves during deep sleep

Beam Me Up:

Question 7. Have scientists ever managed to teleport something? *Yes – light*

Question 8. Can this technology be used on humans? *No*

Research questions, ages 8 - 12

Technology is anything that humans make which helps us to do things. Phones and computers are examples of technology, but so are paper and the wheel. What new technologies might there be in the future?

There are lots of ideas in the Science Fiction Science Future exhibition - maybe you might help invent one of them! To answer the questions on this worksheet, explore the exhibition and have a go on each of the exhibits. You might need to read the graphics panels for clues too.

Our Quantum Future:

Question 1. What does this experiment show about how light travels? _____

_____

Plasma Propulsion:

Question 2. What is propelling the rotor? _____

Question 3. Name two other places we could find plasma

1. _____

2. _____

Choose Your Future:

Question 4. Which question did you find easy to answer? _____

Question 5. Which question was hard to answer? _____

Eye Control:

Question 6. How does the computer know where you are looking? _____

_____

Question 7. Name one type of person who would find this technology useful. _____

_____

Mind Control:

Question 8. Which type of brain wave do you have when you are at your most relaxed? _____

_____

Hey, that robot's copying me:

Question 9. Name two ways robots are already being used in society.

1. _____

2. _____

Beam Me Up:

Question 10. Have scientists ever managed to use instantaneous transportation technology on something?
If so, what? _____

_____

Question 11. Why can't this technology be used on humans? _____

Future Past:

Look at the video from 1910.
Question 12. Name three things they got right.

1. _____

2. _____

3. _____

Question 13. Name three things that didn't happen like they thought it would

1. _____

2. _____

3. _____

Did you know?

In 2013, scientists in Japan created an artificial womb – which had previously been imagined in such science fiction works as The Matrix, Brave New World and Daedalus. It is hoped that this technology could help save prematurely born babies.

Research answers, ages 8 - 12

Our Quantum Future:

Question 1. What does this experiment show about how light travels? *It travels in waves*

Plasma Propulsion:

Question 2. What is propelling the rotor? *Plasma, electricity, or lightning are all acceptable answers.*

Question 3. Name two other places we could find plasma *Correct answers include (but are not limited to): lightning, stars, fire, plasma TV, fluorescent/neon lamps.*

Choose Your Future:

Question 4. Which question did you find easy to answer? *Student's choice*

Question 5. Which question was hard to answer? *Student's choice*

Eye Control:

Question 6. How does the computer know where you are looking? *There is a special camera tracking where your eye is looking.*

Question 7. Name one type of person who would find this technology useful
Correct answers include: People who cannot use their limbs to control the mouse; scientists researching how people find and track information on a screen.

Mind Control:

Question 8. Which type of brain wave do you have when you are at your most relaxed? *Delta waves while sleeping*

Hey, that robot's copying me:

Question 9. Name two ways robots are already being used in society. *Robot pets for the elderly, assisting surgeons*

Beam Me Up:

Question 10. Have scientists ever managed to use instantaneous transportation technology on something? If so, what? *Yes, on light*

Question 11. Why can't this technology be used on humans? *The human body and brain represents too much information to store and transfer. Our computers are not that large or fast.*

Future Past:

Question 12. Look at the video from 1910. Name three things they got right *Possible answers include: Firefighting/policing from the air; voice typing; video telephone; planes and airships.*

Question 13. Name three things that haven't happened like they thought it would. *Possible answers include: police and firefighters flying using strap-on wings rather than in helicopters; barber machine; video telephone is much more compact than their idea; voice typing does not use a typewriter and megaphone; aeroplanes used for most air travel.*

Post-visit Classroom Activities

The Ethics of Innovation

Encourage your children to write essays or conduct debates on the ethics of a new or proposed innovation. For younger children you could hold a class discussion and then have them write down one or two thoughts or draw a picture.

Here are some example discussion points:

Would you eat in-vitro meat?

- Would it gross you out to know your food was grown in a jar?

- What if it meant no more animals had to be killed?

- Would it be better or worse for the environment?

Would you replace your legs with prosthetics to run faster?

- **Would you still be able to compete in games/sports with 'regular' people?**

- **What if people changed their bodies for cosmetic rather than therapeutic reasons?**

- **When do you stop being 'you'?**

Would you want to live to be 150 years old?

- What if your loved ones made the opposite choice to you?

- Would you still expect to retire at 65? What would you do for the next 65 years?

- How would it affect the world's population if people lived longer? How would that affect the environment?
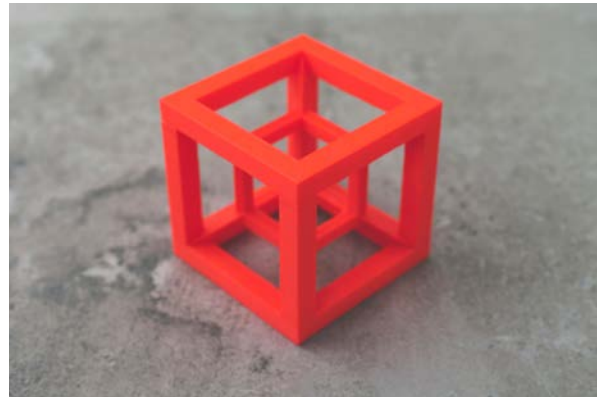
Fourth Dimension Battleship

Introduce students to the idea of a fourth dimension using the game Battleship and explore how it is used in science fiction.

You will need:

• Grid paper for each student

• If possible, an animation of a hypercube (this can be found easily on the internet); otherwise an image of a hypercube will do.

What to do:

Children rule a ten centimetre line and mark coordinates using the grid (e.g. each segment of the line could be assigned a number from 1-10). The students draw marks on their line to represent two ships and then take turns trying to guess where each other's ships are.

After a few minutes get them to stop and discuss whether it was easy or hard. They only had one set of coordinates to deal with because it was a line. This is called the first dimension.

Now have students draw a square and play the game again, but with more battleships allowed. Allow the students to realise that to play the game successfully they will need a second set of coordinates. Discuss whether they should use numbers again or something else (maybe letters). This is the second dimension. Allow them to play for a little while as this is a fun game and it will improve their graphing skills.

Now ask the students how they could add a third dimension onto their grid – perhaps by extending it upwards. What's that called? Height. If you have open ended cubes they can try this, otherwise make it a thought experiment or use the classroom to help them visualise it.

 Say we wanted to describe where something was inside this cube. First we could give a number, then a letter. That would show where it was relative to the base of the cube. But what if the object was

floating somewhere in the middle of the cube? Like an aeroplane flying above the ocean instead of a battleship floating on its surface. Again allow children to realise we would need yet another set of coordinates and choose what it could be (Colours? Types of car?) How many coordinates do we have now? Three – the third dimension.

Now what if we added a fourth dimension to the cube? Now we have a hypercube and we need four coordinates to find our way around in it. This is very hard for us to imagine, because we live in three dimensions and we have not experienced a fourth (unless you include time, but we still experience time very differently to the three spatial dimensions).

We can imagine what this hypercube might look like if we viewed it here in our three dimensions. Show conceptualisation. This hypercube (or tesseract) idea is in *The Avengers* movies as well as lots of other science fiction.

Extend and Discuss

Read *A Wrinkle in Time* by Madeleine L'Engle and discuss how the fourth dimension is envisaged in this book.

You might also want to watch *The Avengers* depending on the age of your students. What are the differences in the use and portrayal of the fourth dimension in these two texts? If we really had access to this kind of technology/power, what would be the benefits of it? What would be the drawbacks? When would it be OK to use it?

English/Science Crossover Lesson

Children explore the links between science fiction novels and/or TV and film, and actual technology – e.g. trans-dimensional travel in *Doctor Who*, DNA technology in *Gattaca*.

Some interesting questions for discussion might be:

- What roles does the technology play in the text? Is it good or bad?

- Is this technology feasible? What sort of similar inventions or scientific advancements have already been made?

- Should we invent this technology?

- What sort of rules would be needed to govern its use?

Robotics

For a classroom-based course on robotics good options include; Edison, Lego Mindstorm, or Beebots (for the early years). These all introduce children to programming in a very simple and accessible way.

For an extended or whole school project: Undertake explorations underwater using OpenROV and OpenExplorer. OpenROV is an open source underwater exploration unit that many schools use to explore their local rivers, lakes and beaches. The results of your explorations can be shared on OpenExplorer. You can also connect this with past technologies and ideas about underwater exploration such as in *20,000 Leagues Under the Sea* by Jules Verne.