

BBC

DOCTOR WHO

WORLDS OF WONDER

WHERE SCIENCE MEETS FICTION



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LARGE PRINT GUIDE

A JOURNEY OF DISCOVERY

Doctor Who has been thrilling us for generations. Since 1963 the world's longest-running sci-fi TV show has transported viewers through time and space, exploring the past, present and future of Earth and the vast reaches of the cosmos beyond.

The show's writers have often drawn on science for inspiration. Astronomy, astrobiology, quantum physics, evolution, cybernetics and genetics are among the many scientific fields explored – and of course, the nature of time itself.

Sometimes stories and characters have tapped into current and emerging areas of scientific research. Sometimes they've speculated on possibilities that science may realise in future. In more than 860 episodes (and counting) *Doctor Who* has asked again and again '*What if?*' and fired our imagination.

But every adventure we take with the Doctor, every new world we explore and discovery we make, all begin here: in the TARDIS control room.

Step inside and prepare for a journey like no other.

KEY EXHIBITS

Designing a classic

Like many scientific ideas and inventions, everything we see on screen in *Doctor Who* starts as an idea: maybe a sketch or some notes.

The TARDIS (it stands for Time and Relative Dimension in Space – but you knew that already, didn't you?) is no exception.

The central console and surrounding control room's design stayed quite similar throughout the 26 years of the Classic Series: a brightly lit, clinical space that looked more like a spaceship, but which was also a practical solution for filming in small studios.

Bigger, bolder design changes would be made for new Doctors in the modern series.

The TARDIS console Mk 1

A faithful reconstruction of the iconic 1963 original, created for the *Doctor Who* 50th anniversary celebrations in 2013. Original design drawings of the console and concept art of modern iterations are also displayed.

A lasting influence

The original hexagonal console idea came from the fertile imagination of BBC designer Peter Brachacki. It was an instant design classic and formed the basis of all future versions of the console in the TARDIS control room.

This is the original sketch used to recreate the Doctor's first console for the 50th anniversary drama *An Adventure In Space And Time*.

KEY EXHIBITS

First Doctor's costume

Every time the Doctor regenerates, we don't just have a new face to get used to. Each Doctor also has distinctive character traits and clothes. The enigmatic First Doctor dressed as if he were an Edwardian scholar.

This replica of his original costume was worn by David Bradley when he reprised William Hartnell's role as the First Doctor.

THE TARDIS TECH ROOM

Welcome to the Doctor's secret workshop, one of many rooms hidden away on board the TARDIS.

As a bit of a 'mad scientist' and inventor, the Doctor loves gizmos, gadgets and experimenting with stuff. Superphones with an ultimate upgrade, trusty sonic screwdrivers, other sonic devices, and even a machine that goes 'ding!' are just a few memorable examples of advanced – and not *quite* so advanced – tech that have played a part in the show's history.

Here you'll also find out more about the science behind the famous blue box. Can something really be bigger on the inside? Is time travel actually possible? And just what, exactly, is a chameleon circuit?

Doctor Who has always celebrated the creative, limitless possibilities of technology. And in some areas of research, the real world is catching up fast. Ideas that were once pure sci-fi dreams are the focus of real science, right now.

KEY EXHIBITS

Hypercube model

Look at the cube. How many dimensions can you see? Maybe it's a hidden additional dimension that gives the TARDIS all that extra space to have a library, sick bay, greenhouse, art gallery, swimming pool and more!

Wormhole model

This simplified model shows how a 'shortcut' might be created between two points in spacetime by bending it.

TOOLS & TECH CAPTIONS

The Second Doctor's sonic screwdriver

The sonic screwdriver made its first appearance in 1968 story *Fury From The Deep*, when Patrick Troughton used it to loosen screws and amplify soundwaves.

The Third Doctor's sonic screwdriver

Want to reverse the polarity of the neutron flow? Jon Pertwee's gadget-loving incarnation upgraded the sonic to do just that, and more. This version had interchangeable heads for different functions.

The Fourth and Fifth Doctor's sonic screwdriver

Used often by Tom Baker for a variety of applications, from opening locks to blowing things up. It was destroyed in one of Peter Davison's early adventures (*The Visitation*, 1982) by an alien Terileptil.

TOOLS & TECH CAPTIONS

The Eighth Doctor's sonic screwdriver

This model featured in the 1996 TV movie, in which the Doctor was played by Paul McGann. It was the first on-screen appearance of a sonic screwdriver in 14 years.

The Ninth and Tenth Doctor's sonic screwdriver

Both Christopher Eccleston's and David Tennant's Doctors often used this new upgrade, which had design features in common with their new-look TARDIS. Note: opens doors but doesn't work on wood.

The Eleventh Doctor's sonic screwdriver

This larger model was again manufactured by the TARDIS – and often lost or destroyed by Matt Smith's incarnation. It had many new applications and could be activated by the user's thoughts.

The War Doctor's sonic screwdriver

Used by John Hurt's previously 'hidden' incarnation, who fought in the Last Great Time War. It featured in 50th anniversary special, *The Day Of The Doctor* (2013).

The Twelfth Doctor's sonic screwdriver

Peter Capaldi's Doctor claimed sonic screwdrivers 'spoil the line of your jacket'. As well as this new TARDIS-made model he also had working copies of many previous versions stored in a cup!

TOOLS & TECH CAPTIONS

The Thirteenth Doctor's sonic screwdriver

Forged from scrap metal and borrowed alien tech, this version was hand-made by Jodie Whittaker's Doctor in her debut episode, *The Woman Who Fell To Earth*, 2018.

River Song's sonic screwdriver

Gifted by the Doctor to upgrade River's 'embarrassing' sonic trowel, this version also contained a neural relay that was able to save and store human consciousness after death.

Sonic cane

A sonic screwdriver substitute seen onscreen in *Let's Kill Hitler*, Series 6, 2011. Used by the Eleventh Doctor for scanning, communications and as a stylish fashion accessory in 1930s Berlin.

Missy's sonic umbrella

First used sonically by Michelle Gomez's female incarnation of the Master in two-part story *World Enough And Time / The Doctor Falls*, 2017.

Sonic sunglasses

Stylish 'wearable tech' favoured by Peter Capaldi's Twelfth Doctor, including free internet. Warning: may reveal browser history.

Modified optician's glasses

Used by the Twelfth Doctor in *Flatline*, Series 8, 2014, during an encounter with bizarre two-dimensional aliens, the Boneless.

TOOLS & TECH CAPTIONS

The machine that goes 'ding!'

Home-made gadget used by David Tennant's Tenth Doctor in the 50th Anniversary special *Day of the Doctor* (2013) to detect Zygon DNA. The machine can also microwave frozen dinners from up to 20 feet and download comics from the future. Handy!

River Song's sonic trowel

Essential kit for the archaeologists of the future. It generates a sonic field to loosen dirt from artifacts – and also fires an energy beam, as demonstrated in Christmas Special *The Husbands of River Song* (2015).

Confession dials

An arcane item of Time Lord technology from Series 9, 2015. It's advisable not to get teleported inside this disc – you could be trapped for more than four billion years, like Peter Capaldi's Twelfth Doctor. The ultimate lockdown.

ROBOT DISPLAY & CAPTIONS

Robots: friend or foe?

Robots have always been a key ingredient in *Doctor Who*. They have appeared in all shapes and sizes: from giant, industrial and military robots, to an extraordinary range of humanoid creations – and even tiny nanobots.

But all of them have something in common. They reflect our complex relationship with robots, and explore our varying attitudes towards them.

In reality, robots are increasingly part of our daily lives. They assist us in making rapid progress in many fields of science and industry, such as medicine, engineering, agriculture and exploring our cosmos. But *Doctor Who* stories featuring robots often tap into our inner fears about automation. Machines created to serve us may go horribly wrong, or one day take over and destroy us.

So, are robots our friend or foe? In *Doctor Who*, the answer is: both. Only time will give us the answer here in the real world.

ROBOT DISPLAY & CAPTIONS

K9: a Time Lord's best friend

The Fourth Doctor's much-loved robotic dog had powerful computer-driven artificial intelligence and a handy laser hidden in his snout. A regular companion on the show from 1977–1981, he later reappeared to help David Tennant's Tenth Doctor in the episode *School Reunion* and also starred in several spin-off shows.

K1: the giant robot

Back in 1974, the Fourth Doctor's first challenge was dealing with this rogue robot. K1's original purpose had been to replace humans in dangerous activities such as mining and handling radioactive materials.

Four decades on from this story's first broadcast, robots built for difficult and hazardous industrial tasks are in operation all around the world. Luckily, so far none of them have killed their creators, gone on a rampage and grown to an enormous size.

ROBOT DISPLAY & CAPTIONS

War machine: the Skovox Blitzer

In *The Caretaker*, Series 8, 2014, the Twelfth Doctor had to work fast to deal with this lethal alien robot designed for war. Could something like the Blitzer become a reality in our own future?

Today, military robots are in development around the world; some are already in use. Autonomous or remote-controlled robots are used in a number of ways, from transport, surveillance and search-and-rescue operations, to direct attack. They may well play a central part in future conflicts if our species doesn't learn to get along better.

Warning: these androids may hide under your bed!

The Tenth Doctor tangled with a group of these beautifully designed but dangerous clockwork androids in *The Girl In The Fireplace* (Series 2, 2006), an episode partly set in 18th-century France.

In reality, some of the first working 'modern' biomechanical automatons were created there. In 1737 French inventor Jacques de Vaucanson unveiled the first of his eerie mechanical humans, which played the flute. He also made a clockwork pooing duck. You really did have to make your own entertainment before the age of TV.

ROBOT DISPLAY & CAPTIONS

SV7: creepy mechanical man

This is the head of a Super-Voc, one of the eerie android servants from classic Tom Baker story *The Robots of Death*, which terrified a generation of younger fans in 1977.

The story shows us a civilisation that has become heavily dependent on robots – and what happens when those robots are reprogrammed by a mad scientist to turn on their human masters. Spoiler: it's not good news for the humans.

Loaned by Andrew Beech

Deadly angels: the Host

Robot butlers built to serve drinks and nibbles can only be a good thing, right? Not when they're programmed by a madman and you're trapped on a crashing spaceship version of the *Titanic*, as the Tenth Doctor discovered in 2007's Christmas Special, *Voyage Of The Damned*.

The design of the Host was a tribute to the elegant Art Deco androids of *The Robots of Death*. Can you see the similarities?

ROBOT DISPLAY & CAPTIONS

Handles: a friendly face

The Doctor has always been big on recycling technology. So perhaps it wasn't such a surprise when Matt Smith's Eleventh Doctor repurposed this battered Cyberman helmet as an assistant, wiring it into the TARDIS console. After centuries of faithful service, Handles' computer brain finally broke down beyond repair, leaving the Doctor bereft.

The half-face man

This creepy android was programmed to rebuild itself using organic parts from humans.

There are historical accounts of real mechanical automatons from ancient China and Greece, and from Medieval Asia and Arabia. By the 19th century automaton manufacture had reached a golden age: they were made in their thousands for fairs, circuses and well-off households. How would you like this one in your lounge?

CROOKED MAN PANEL / CAPTION

Trapped in a pocket universe

This strange alien is the Crooked Man, who featured in the spooky haunted house episode *Hide*, in 2013.

Hide explored the idea of pocket universes, which theoretical physicists suggest may exist undetected alongside our own known universe. Each pocket universe might have its own unique set of physical laws – such as time running at very different speeds. And there could be a countless number of them out there.

Pocket dimensions or universes have featured elsewhere in *Doctor Who*. The Doctor's planet Gallifrey was hidden in one to save it from destruction. The TARDIS crew experience tragic consequences in *The Girl Who Waited*. Much earlier, 1960s stories *The Celestial Toymaker* and *The Mind Robber* were set in bizarre dimensions outside known spacetime.

COSMIC CURIOSITIES

Space travel has been a huge part of *Doctor Who's* history. The 'high frontier' provides an endless source of inspiration for stories, characters and alien worlds.

Real science has made huge progress since *Doctor Who* began. We have landed on the Moon, confirmed the existence of black holes, detected gravity waves and discovered the first planets outside our solar system. We are entering a golden age of space exploration, aided by rapid technological leaps.

Today we have a permanently manned space station orbiting the Earth, while a host of robotic probes reach further into the solar system, sending back new information. With each discovery, our understanding of the cosmos is being reshaped.

And we've only just begun. Scientists around the world continue to observe, gather knowledge, test ideas – and imagine. Our universe still has countless secrets to reveal.

Space age soundtrack

The sounds you hear are taken from Classic Series episodes of *Doctor Who*. Atmospheric sound was crucial to the early success of the show – it brought to life alien beings, strange planets and the mysterious wastes of space.

These unearthly soundscapes and spooky noises were created by the pioneering BBC Radiophonic Workshop. Composers such as Delia Derbyshire, Dick Mills, Roger Limb, Paddy Kingsland and Brian Hodgson helped to make the show unlike anything else on TV in the 1960s and '70s. They used found sounds, tape loops, oscillators and primitive analogue synthesizers to create their unique sound effects and music.

In the modern era, the show has also experimented with binaural '3D' sound in the 2017 episode *Knock Knock*. This is a way of recording sound that uses two microphones; it mimics how we actually hear sound in the real world.

SPACESUIT DISPLAY PANEL & CAPTIONS

Survival in space

The Doctor's travels show us possible futures where our species has spread out across the stars, colonising the universe. Perhaps one day that will be true. But for now, we take baby steps out into the cosmos, as a small but growing number of astronauts experience the ultimate out-of-this-world trip.

Spacesuits are critical for survival in the inhospitable vacuum of space. They provide essential life support systems and protection from extreme temperatures. Even the Doctor needs to don a spacesuit once in a while.

Here are a few examples that have featured in the show.

Clara's orange spacesuit

This is one of the iconic orange spacesuits that have kept cropping up in the show since 2006. It was worn by companion Clara Oswald twice, including the memorable occasion when she walked on the Moon with the Twelfth Doctor in *Kill The Moon*, (Series 8, 2014). Unlike the Doctor, Clara wasn't keen on the bold colour – she said it made her eyes hurt.

Real astronauts do wear high-visibility orange suits during launch and landing of the space shuttle. While in space, these suits are worn only inside the shuttle. Even in space, there's a dress code.

SPACESUIT DISPLAY PANEL & CAPTIONS

Spacesuit from the 51st century

This spacesuit was worn by archaeologist River Song, played by Alex Kingston, in fan-favourite two-parter *Silence In The Library / Forest of the Dead*, Series 4, 2008.

This story was set on a planet-sized library dedicated to storing all the knowledge in the universe. Like most libraries today, it was deserted.

***The Impossible Astronaut* spacesuit**

This suit was designed to look like those used by real astronauts on the *Apollo 11* Moon landing in 1969. It was worn by River Song in Series 6, part of which was set at the time of the historic Moon mission.

The original *Apollo* spacesuits made for NASA were basically a one-piece suit, custom-made to fit each astronaut.

Loaned by Robert Allsopp.

***Chasm Forge* mining suit**

The Twelfth Doctor, Nardole and Bill Potts wore this type of spacesuit in *Oxygen*, Series 10, 2017. This episode asked some of the big questions about survival in space – such as how long can a human survive without oxygen, and, more importantly, what happens when you throw up in a spacesuit?

These technologically advanced smartsuits were computer-controlled. They could run, jump and even update your Facebook page: good! They were also owned by a ruthless mining corporation: not good.

SPACESUIT DISPLAY PANEL & CAPTIONS

How to sound like a Dalek

Those dulcet Dalek tones are created using a clever piece of technology called a ring modulator. It looks like a guitar effects pedal, and versions of it have been used in electronic musical instruments since the late 1940s.

It works by multiplying two signals together to create two new frequencies that sound harsh and non-musical. Early designs had a ring of diodes as part of their circuitry – which is where the name ‘ring modulator’ comes from.

As well as creating the unmistakable grating voices of the Daleks, this technology has also been used for voicing the Cybermen and creating other sound effects in *Doctor Who*.

SPACESUIT DISPLAY PANEL & CAPTIONS

Omega: first of the Time Lords

This is Omega, pioneering solar engineer. Thousands of years ago he discovered how to harness the power of a black hole to provide his fellow Gallifreyans with the power to manipulate time. Legend had it he died in the process, but – you’ve guessed it – he survived. Believing he had been abandoned by his people, he was *very* unhappy.

The vengeful Omega existed in an antimatter dimension – a point in spacetime found only within the one-dimensional singularity at the centre of a black hole. All known physical laws cease to exist there.

Writers Bob Baker and Dave Martin were inspired by emerging scientific theories about black holes when they created Omega in 1972. He debuted in 10th anniversary special *The Three Doctors*, the first ever multi-Doctor story. Apparently destroyed, Omega later made a surprise return, menacing the Fifth Doctor in the 20th anniversary season.

Screen-used Omega costume from *Arc of Infinity*, Season 20, 1983.

MODEL DISPLAY PANEL & CAPTIONS

Model worlds

Today *Doctor Who* uses CG animation to create most of the amazing visual effects we see on screen. But in the days before this technology was available, the Classic Series relied heavily on the use of physical models and dioramas.

These were hand-built with painstaking attention to detail. Working with scant resources and small budgets, the BBC's visual effects designers used their imagination and ingenuity to produce remarkable work. They also looked to the latest scientific information for ideas when creating spacecraft and other worlds.

Here are a few rare examples of models created for the show's Classic era.

Skagra's spacecraft from *Shada*

Due to industrial action in 1979, *Shada* became infamous as the only *Doctor Who* story that was never finished or shown on TV. It was finally, fully, completed for commercial release in 2017.

Visual effects supervisor Mike Tucker reconstructed the villainous Skagra's spacecraft for new film sequences – all of which took care to use only the technologies that would have been available to the BBC in 1979.

Loaned by Mike Tucker.

Original sketch of Skagra's spacecraft

VFX designer Dave Havard's initial drawing is remarkably similar to the final model seen in *Shada*.

MODEL DISPLAY PANEL & CAPTIONS

Think Tank space station

Models reconstructed for the completion of *Shada*, using vintage kit parts. Surviving photographs were used as reference to ensure the new version was as close to the 1979 original as possible.

Loaned by Mike Tucker.

The *Nosferatu*

This spacecraft featured in Seventh Doctor story *Dragonfire*, screened in 1987. It was set on Iceworld, a trading colony on an inhospitable frozen planet.

In our solar system, Uranus holds the record for the coldest temperature ever measured in our solar system: -224.2°C . Earth is positively mild by comparison – our lowest temperature, recorded in Antarctica, is a balmy -89.2°C !

Loaned by Mike Tucker.

***Nosferatu* – original design drawing**

The design of this spacecraft included features that would be useful for a frozen planet, including special high-powered vents to thaw surface ice before take-off.

We may still be a long way from sending astronauts to the further reaches of our solar system, but probes are exploring the cold wastes of space at this very moment.

Loaned by Mike Tucker.

BIOSCIENCE FRONTIERS

Doctor Who doesn't just set its sights on the stars. It has many stories based down here on Earth, too.

The show's writers and designers have often taken ideas from the study and understanding of life itself. The amazing biodiversity and complex living systems our world supports are an endless source of inspiration.

Biologists are constantly learning more about the natural world, and discovering that life is everywhere – from the tallest mountain peaks to the deepest ocean trenches. As you'll see when you explore this zone, Nature is more beautiful, brilliant and bizarre than any sci-fi fantasies. No wonder the Doctor is so keen on Earth.

KEY EXHIBITS

Robo-explorers on Mars

This is Gadget, a robotic probe that featured in *The Waters Of Mars*, an episode set in 2059, imagining a future where the first humans are colonising Mars.

Gadget looks similar to NASA's Curiosity Rover, which is exploring Mars right now. It has collected samples of dusty Martian soil for scientists to study back here on Earth. Chemical analysis has revealed 2% of Martian soil still contains water – evidence that ancient Mars was a much wetter planet.

For hundreds of millions of years Mars had rain, rivers and an ocean covering around half of the planet's northern hemisphere. So: over four billion years ago the Red Planet was blue!

“Gadget, Gadget!”

Screen-used Gadget robot probe and operator's gloves, from Tenth Doctor Special *The Waters Of Mars*, 2009.

Turbulent orb

Spin the globe and watch the fluid patterns that form. They are similar to the movements of planetary atmospheres.

KEY EXHIBITS

Europa: the search for life

Are we alone in the universe or are there really extraterrestrials out there?

The quest for evidence of life on other planets has fired our imagination for many generations, and it's a major focus of space exploration today.

For astrobiologists, the search starts with looking in the right places. They scan for planets and moons that may have the two conditions that are vital for simple life to begin: liquid water and geological activity.

Jupiter's icy moon Europa probably has both of these. It is one of the most promising locations in our solar system for finding life.

Alien life: small or tall?

Doctor Who aliens often tend to be humanoid and sometimes *very* tall – like this scary alien warlord, the Fisher King. But many scientists think that if we do find life on other worlds, it will likely be very small.

Detecting chemical signs of microscopic life on distant planets outside our solar system is just beyond technology's reach – for now. But we already have increasingly powerful sensors that can detect molecules in the atmosphere of planets and moons in our own solar system.

Screen-used Fisher King costume from *Before The Flood*, Series 9, 2015.

KEY EXHIBITS

Extremophiles: life on the edge

Astrobiologists study extreme environments here on Earth to see what kinds of organisms are able to survive in places that are inhospitable to other life. These hardy life-forms are called extremophiles. Most are small and some of them look like ready-made *Doctor Who* aliens when magnified under powerful lenses.

Deserts, caves, deep sea hydrothermal vents and extremely salty, acidic or alkaline places all have their own types of extremophiles. Finding them requires a lot of imagination and technical skills to overcome obstacles, such as darkness, high pressure, lack of oxygen and extreme temperatures.

Meet some of the bizarre extremophiles we've discovered so far. Most are microscopic but some are much more complicated. Could life on other planets be like any of these?

Exploring the deep

Probes are exploring our solar system, but to find life out there we need to understand life here on Earth. Special underwater vehicles such as the *Deepsea Challenger* and *Alvin* are exploring the depths of our oceans more than 6 miles (9.6 km) below the surface, where the pressure is greater than the surface of Venus. It may be cold and dark in the depths... but it is far from lifeless.

Original screen-used scale model version of the Twelfth Doctor's 19th-century diving suit from *Thin Ice*, Series 10, 2017.

KEY EXHIBITS

Karvanista: man's best friend?

Karvanista is a Lupar, a species of highly evolved dog-like alien warriors. They are species-bonded to protect humans, with which they form a symbiotic relationship. Sometimes unwillingly.

Symbiosis is common in the natural world. It's often used to describe a relationship between two organisms where one or both benefits from that relationship.

Our pet dogs are an example of this. DNA evidence shows that all modern domestic dogs are descended from a common wild ancestor – the wolf. Humans and wolves began co-existing around 130,000 years ago.

Screen-used Karvanista costume, *Doctor Who: Flux*, 2021.

The telepathic Teller

Telepathy is a form of direct brain-to-brain communication used by Time Lords and other alien species, including the Teller. This strange-looking creature was enslaved and used as an ultimate lie detector: it could scan people's thoughts and detect guilt. Politicians and bankers beware.

Science has yet to prove that any form of telepathic communication actually exists. Many studies have either been inconclusive or discredited.

Screen-used Teller costume, *Time Heist*, Series 8, 2014.

KEY EXHIBITS

The enemy within

Inside every Dalek travel shell lurks a writhing, slimy tentacled creature. Looks like a squid or an octopus, doesn't it?

Dalek mutants usually remain encased in their shells for life. But 'recon scouts' like this one, sent to Earth in preparation for a Dalek invasion, are able to hitch a ride on human hosts and control them like flesh puppets. Daleks aren't very nice, are they?

Screen-used Reconnaissance Dalek prop from *Resolution*, 2019.

The Doctor's Cabinet of Curiosities

When you travel as much as the Doctor you're bound to bump into a variety of weird and wonderful life-forms. Here are just a few examples that have featured in *Doctor Who* since the 2005 revival. How many do you recognise?

1. The Ood

A fan-favourite alien from the modern show. They come in peace (mostly). First seen in *The Impossible Planet*, Series 2, 2006.

2. The Mire

The lamprey-like head is usually concealed under heavy armour, as glimpsed in *The Girl Who Died*, Series 9, 2015.

KEY EXHIBITS

3. Pig-slave

One of the pig-human hybrids genetically engineered to serve the Daleks. From the *Daleks in Manhattan / Evolution Of The Daleks* two-parter, Series 3, 2007.

4. The Flood

This was once Andy Stone, one of the unlucky astronauts infected by lethal virus-like entity The Flood, in *The Waters of Mars* Special, 2009.

5. Jabe, a Tree of Cheem

A peaceful humanoid descended from the rainforests of Earth, seen in *The End Of The World*, Series 1, 2005.

6. The Hath

A fish-like humanoid species that featured in *The Doctor's Daughter*, Series 4, 2008.

7. Whisper Man

Shape-changing agent of the Doctor's old enemy, the Great Intelligence. From *The Name Of The Doctor*, Series 7, 2013, and quite frankly terrifying.

8. Dream Crab

AKA the Kantrofarri, these predatory creatures feed on human brains. Horrible, isn't it? From the *Last Christmas* Special, 2014.

When is a spider not a spider?

This is one of the mutated bacterial life-forms encountered by the Twelfth Doctor on the Moon. It looks a lot like a spider, doesn't it?

Nature is packed with examples of species that look similar to something else. Sometimes organisms have independently developed similar body shapes or other adaptations such as horns, spikes or stripes – even though they are not closely related, and may live in entirely different parts of the world. This is called convergent evolution.

Some organisms look similar because they are solving the same evolutionary problems – such as plants from very different families adapting to living in deserts. But some organisms mimic others for an ecological benefit, such as harmless hoverflies looking like wasps to scare off predators.

Screen-used Spider-germ prop from *Kill The Moon*, Series 8, 2014.

THE MONSTER VAULT

Some scientists think we may be alone in the universe. But the Doctor's travels have shown us a version of the cosmos teeming with all kinds of exotic alien life.

Some of these species are friendly. Some of them definitely aren't. But many have been inspired by ideas taken from real scientific concepts and the natural world around us.



WARNING

This room does not have a sofa to hide behind.

Parents should be accompanied at all times by responsible children.

KEY EXHIBITS

Daleks: designer life-form

The Doctor's arch-enemy! Despite a few modifications over the decades, the Daleks have always stayed close to their original concept. Encased in their iconic 'pepper pot' travel machines, they're still everyone's favourite genetically-modified species bred for hatred, conquest and genocide.

What might be the consequences of engineering designer life-forms in real life?

Mk 1 Dalek design, first seen in the debut Dalek story, *The Dead Planet*, Season 1, 1963.

Loaned by Andrew Beech.

Davros: the ultimate mad scientist

Brilliant mind, amoral genius, creator of the Daleks and owner of the only chair on the Dalek home planet Skaro.

Davros' first screen appearance was in 1975's classic *Genesis Of The Daleks*, when the Doctor tried to prevent the creation of the Daleks. This later version of Davros featured in 1980s stories featuring the Fifth and Sixth Doctors.

KEY EXHIBITS

Weeping Angels: living statues

Quantum-locked aliens that can only move when not observed, the Weeping Angels feed on energy. They particularly enjoy feasting on the energy released when they displace their victims through time.

The angels are a great example of *Doctor Who* exploring the possibilities of life-forms that do not operate within our known rules of organic life. They're also very scary.

Cybermen: a cyborg army

A relentless, deadly enemy that first challenged the Doctor in 1966. Cybermen were originally human-machine hybrids who had lost all emotions as the conversion process evolved.

They have gradually enhanced and upgraded their armies using new armour, a hive mind, cloaking technology and even complete removal of all organic parts – becoming fully robotic, artificial-intelligence life-forms.

Cyber-Controller from *Rise Of The Cybermen/The Age Of Steel*, Series 2, 2006

KEY EXHIBITS

Mk 1 Cyberman head (original): *The Tenth Planet*, 1966

Mk 2 Cyberman head: *The Moonbase – The Wheel In Space*, 1967–68

Mk 3 Cyberman head (Leader): *The Invasion – Revenge Of The Cybermen*, 1968–1975

Mk 4 Cyberman head: *Earthshock – Silver Nemesis*, 1982–1988

Mk 4 Cyberman head (Controller): *Attack Of The Cybermen*, 1985

Do not feed the Cybermat!

This small cyborg creature looks cute, but it's very dangerous.

Millions like it were engineered to work for the Cybermen. Cybermat jobs include spying on humans and attacking them, either with sonic waves or by injecting them with toxins. They do not make ideal pets.

Cybermat designs were based on woodlice and silverfish – two real-life arthropods (creepy-crawlies) you can find in your own home or garden.

Move the lever to bring the cybermat to life, if you dare. Just don't let it bite you.

KEY EXHIBITS

Ice Warriors: Warlords of Mars

A species of humanoid reptilian warriors that evolved to thrive on Mars.

Their iconic 'armour' is a sophisticated bio-suit for survival in extreme conditions.

Robotic components allow for independent movement when the Ice Warrior isn't actually inside the suit.

Armour of Leader Varga, *The Ice Warriors*, Season 5, 1967

Ice Queen Iraxxa

The Ice Warriors aren't all boys. Their complex, militaristic society was once ruled by Queen Iraxxa.

Like many reptiles, Ice Warriors are able to brumate – which is basically hibernation for cold-blooded animals. When the surface of Mars became too inhospitable to support life, Iraxxa and her species became dormant in underground caves, or 'hives', for thousands of years.

Screen-used Queen Iraxxa costume, *Empress Of Mars*, Series 10, 2017

KEY EXHIBITS

Sontarans: a clone species

There's nothing Sontarans enjoy more than a good war. A clone species produced in their millions for battle, they have tried to conquer Earth several times. Luckily the Doctor is always around to stop them.

If you're feeling the urge to shout 'Sontar-HA!' right now, don't worry. This is perfectly normal.

Armoured Sontaran warrior costume from *Doctor Who: Flux*, 2021.

Sea Devils and Silurians: highly evolved reptiles

Millions of years before humans evolved and created a show called *Doctor Who*, civilisations of advanced reptile beings ruled our planet.

Fearing a cataclysmic asteroid strike like the extinction event that wiped out the dinosaurs, the Sea Devils and Silurians hibernated in vast cities deep underground and beneath the sea. But they overslept. When accidentally woken by our modern industrial activities, many are very unhappy to find apes have taken over – and they want their planet back.

Screen-used Sea Devil costume, *The Legend Of The Sea Devils*, 2022.

KEY EXHIBITS

Silurians '80s style

This foam head is a recreation of the Silurians seen in *Warriors Of The Deep* (1984), a Fifth Doctor adventure.

The design is a variation on the original Silurians, which made a big impression on fans tuning in to see Jon Pertwee's first season as the Doctor in 1970.

Madame Vastra

A Silurian ally of the Eleventh Doctor, who first appeared in *A Good Man Goes To War*, Series 6, 2011. Silurians in the modern series were redesigned to have more expressive faces and a more human-like appearance.

Dregs: the future face of humanity?

In one possible future timeline, Earth is devastated by a nuclear war, following the chaos caused by global warming. The few surviving humans left behind eventually evolved into mutated beings called Dregs, such as this one.

Dregs have adapted to survive high radiation; in a barely-habitable world with low oxygen levels they can also breathe carbon dioxide.

Screen-used Dreg costume, *Orphan 55*, Series 12, 2020.

KEY EXHIBITS

Prisoner in the mirror

Appearances can be deceptive. This cute little girl is actually Daughter/Sister of Mine, one of the evil, parasitic aliens known as the Family of Blood. They hunted the Tenth Doctor for his life force – and lived to regret it. As punishment, Daughter Of Mine was imprisoned by the Doctor in every mirror in existence.

Once a year, the Doctor still visits her. And maybe, if you've ever looked in a mirror and glimpsed a shadow behind you, you've seen her too.

Into the Dalek!

The Twelfth Doctor and Clara spent an episode shrunk to miniature size, exploring the inside of a damaged Dalek, nicknamed 'Rusty'.

We can't make you shrink, but you can step inside this Dalek casing. Why not get someone to take your photo?

WELCOME TO THE LAB

Sci-fi and fantasy fiction offer escapism but they are also a way of exploring issues affecting us and our world. *Doctor Who* is very much part of that tradition.

The Doctor's travels in space and time have shown us many visions of humanity's future. But just as often, the show presents a mirror – reflecting our own present-day hopes and fears.

Today, science and technology are revolutionising every aspect of our lives. Rapidly accelerating changes in medicine, computing, transport and communications may be transforming the future of our species.

Cloning, DNA manipulation, cybernetics and AI are all influencing what it means to be human. There are great benefits – but there are also big ethical questions and potential risks. Advances now enable us to make huge changes to ourselves and our planet... but should we?

Because if it all goes wrong, the Doctor won't be there to save us from ourselves.

KEY EXHIBITS

Emojibot: a human mood monitor

This is one of a group of robots built to help humans establish a colony in space. They communicate via Emoji symbols and serve as an interface to AI nanobots called Vardy.

The swarming Vardy can construct buildings, pollinate crops and monitor human health. But a glitch in their programming identified grief as a disease in humans and they wiped out any unhappy colonists detected by the emojibots.

The nanobots were named after real-life scientist Andrew Vardy, who studies swarm robotics and biologically inspired robots.

Screen-used Emojibot prop, *Smile*, Series 10, 2017.

Kerblam Man: the future of the workplace?

This automaton appeared in a Thirteenth Doctor episode that focused on current concerns about big business and increasing automation in the global workplace.

As robots perform a wider variety of tasks, what will happen to all the people no longer needed as workers? Will there be enough new jobs created to provide mass employment in the decades ahead?

Screen-used delivery bot prop, *Kerblam!*, Series 11, 2019.

KEY EXHIBITS

Hydroflax: cyborg king

Meet His Infinite Majesty King Hydroflax of the Final Cluster: a tyrannical dictator and cannibal from the 54th century. He sacrificed his humanity to become a cyborg that looks an awful lot like comedian Greg Davies.

Hydroflax had become almost entirely robotic apart from a detachable organic head. But don't laugh at him, or he'll have you flogged, flayed and burned. He's that kind of guy.

Screen-used prosthetic, *The Husbands Of River Song* Christmas Special, 2015.

A cure at any cost

This is one of the Sisters of Plenitude, an order of Catkind nuns that established a hospital on New New Earth in the far, far future. There they were able to treat all diseases known to humanity – but at a terrible cost. Their advanced medical knowledge was gained by experimenting on thousands of artificially grown humans.

Cloning an entire human is now in the realm of real science, not just sci-fi, but there are major ethical concerns. Most countries have banned human cloning for the time being.

Screen-used Novice Hame costume, *Gridlock*, Series 3, 2007.

TIGMI: the future of healthcare?

This hand-held AI device was used by the character Bel in the epic adventure *Flux*. It monitored the health of Bel's unborn child and allowed her to track and communicate emotional wellbeing.

AI may play a big part in future healthcare. Machine-learning tech is being trialled now for a wide variety of applications. These include monitoring our stress levels and nutritional needs, detecting diseases such as early-stage skin cancer, and providing care support to the elderly.

But as with all new technology, there are also risks. The World Health Organisation has already warned of potential ethical and human rights issues if new AI technology is unregulated.

Screen-used TIGMI prop, *Doctor Who: Flux*, 2021.

The Face of Boe: extending life

The enigmatic Face of Boe was an alien ally of the Ninth and Tenth Doctors. He was rumoured to be one of the oldest beings in the universe, and the last of his species.

Humans are seeking to live longer lives, too. Modern medical science is exploring many ways to achieve this. We can already control or eradicate many diseases. New vaccines may rejuvenate our ageing immune system and drugs could remove so-called 'zombie' or senescent cells that accumulate in our bodies with age.

We may wish to live longer but will it lead to better quality of life, and what might be the cost to our planet? There are currently 7.9 billion people in the world – by 2050 there may be 9.7 billion of us. What happens if all those people live longer?

KEY EXHIBITS

Presenting... The Lady Cassandra!

Here's a living exhibit from a museum of the very distant future. This is Lady Cassandra O'Brien, the last 'pure' human.

Cassandra became obsessed with a warped idea of perfection through surgery. After 708 operations she was reduced to life as 'a bitchy trampoline'. Her skin had to be constantly moisturised by attendants to prevent it from drying out and splitting.

But the Tenth Doctor and Rose discovered she was ultimately more tragic than villainous, having lost sight of all that once made her human, and sacrificing it in her narrow quest. Cassandra's loneliness is a poignant reflection on what it might be like if we allow advanced technology to rob us of our basic humanity, in pursuit of longer life and ideas of physical perfection.