



# THE VIRTUAL UNIVERSE

**Elizabeth Pearson** looks into how virtual reality can transport you from your living room to the surface of Mars and beyond

**H**ave you ever wanted to look out of the Cupola on the International Space Station and watch the world passing below you? Have you wished you could walk on the surface of Mars, sit at the controls during the Apollo 11 mission, or fly over the Milky Way? Now, thanks to the increasingly sophisticated world of virtual reality, or VR, you can.

To run the most advanced VR programs at home you will need a VR headset, such as the HTC Vive or Oculus Rift, as well



**ABOUT THE WRITER**  
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as a computer running Windows with enough power to run the software that controls them (unfortunately, most VR games do not support Macs). But if you don't have the hardware, don't worry. With the use of a cardboard viewer that can be bought for a few pounds, any smartphone with a gyroscope can be transformed into a VR headset, capable of running several programs. Over the following pages, we'll take a look at some of the best apps and games that can help you explore the Universe. ▶

# PLANETARIUMS & STAR CHARTS

Turn your smartphone into your personal planetarium

## Universe2Go

Android; Free • iTunes; Free

Using a special viewer with a glass front (£59.90), this app projects what's shown on the phone's screen onto your view of the night sky, allowing you to identify real stars

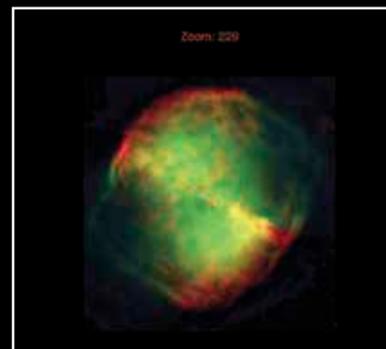
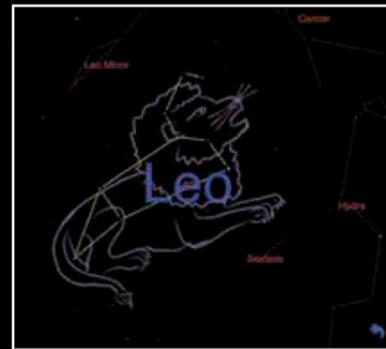
simply by looking at them. You can use overlaid constellation lines and names to make the patterns more familiar, or turn them off for an unimpeded view.

The system uses a sequence of head tilts to navigate around the menu system. This includes the option to choose between modes to get audio descriptions from a cultural, historical or scientific perspective.

It can take some time to get the brightness settings balanced so you can see both overlay and the night sky but, once correct, the app is a great aid in navigating the stars

Not all smartphones have the in-built gyro required for the app to work properly, so check before you buy.

<https://universe2go.com>



▲ Universe2Go shows art and astrophotos

## Star Chart VR

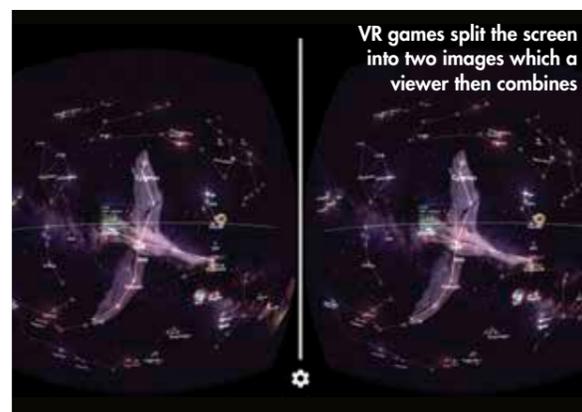
Android; £2.99 • iTunes; £0.99 • Oculus; £3.99 • Vive; £6.99

This app straddles the line between a star chart and a deep-space explorer. You float above the Solar System, and can swoop from place to place by clicking on planets using the headset's buttons to get a closer look. Then swap to Earth View for a total 360° vista of the night sky. Look at a star to bring up scientific information about it.

[www.escapistgames.com/sc.html](http://www.escapistgames.com/sc.html)



Star Chart VR lets you soar around the night sky



VR games split the screen into two images which a viewer then combines

## Startracker VR

Android; free  
Oculus; £0.79

A beautifully rendered and simple star chart, this app fills the sky with the stars of the 88 constellations and over 100 deep-sky objects, positioned as they would be in the sky above you. Though all the stars are shown with equal brightness, you can bring up an info box with their magnitude by looking at them.

<https://sites.google.com/site/pyopyostudioapp>

# TOURS & SIMULATIONS

Your ticket to unreachable destinations

## Mission:ISS

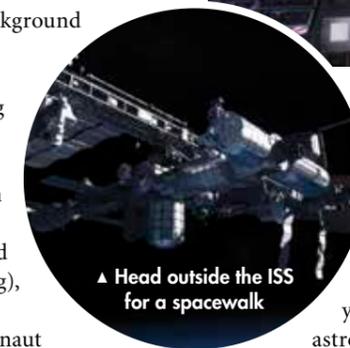
Oculus; Free

Mission:ISS allows you to explore a highly realistic model of the International Space Station (ISS), which includes every detail down to the stickers on the walls and the background hiss of the air system.

Inside, you move around the station using handrails and pushing off walls, like a real astronaut. Navigating in all three dimensions is quite disorientating (and can be a little nauseating), but it does recreate the feeling of being an astronaut getting to grips with microgravity. The Explore mode lets you move freely about the station and its modules, including the Cupola, which



▲ Coax in a resupply vehicle



▲ Head outside the ISS for a spacewalk

gives you a glorious view of Earth passing below you. Meanwhile, Mission mode takes you on a tour of the space station, setting

you various tasks such as capturing a resupply craft or performing a spacewalk to check for damage.

<http://missioniss.magnopus.com>

## Apollo 11 VR

Vive; £7.50  
Oculus; £7.99

Apollo 11 VR is an interactive documentary that lets you join the historic mission by putting you in the place of Buzz Aldrin. During certain segments, such as landing the lunar module, you can choose to take control of the action yourself. The voice-over features archive recordings from mission control.

<http://immersivevreducation.com>



## Titans of space

Android; Free • Oculus; £5.99  
Vive; £5.59

Take on the role of a Solar System tourist and soar past scale representations of the planets and their moons. Then watch as the action pulls back to show you how our Sun measures up against its stellar cousins, and with the Solar System at large. The premium headset version includes a voice-over for you to enjoy.

<http://titansofspacevr.com>



Each world has its own fact file



The school bus Mars VR experience was a big hit with the kids

## A FIELD TRIP TO MARS

Hoping to inspire the next generation of Martian engineers and astronauts, bus loads of children were transported to the Red Planet

In 2015, groups of schoolchildren boarded what appeared to be an everyday yellow school bus in Washington, DC. But after a few minutes of driving, the windows turned dark and then suddenly, the children were transported to the surface of the Red Planet.

"The windows were actually transparent screens," says Ron Fosner, who was lead developer on the project, called Field Trip to Mars. "From inside a dark school bus they look like a regular window, but then we opaque them and the monitors come on, showing the surface of Mars. It was a stealth installation, so from the outside you couldn't tell that anything was different."

To create the view, the team had built a virtual representation of Mars in a computer, then displayed this on the screens to make it look like they were driving along the Martian surface. Using GPS, accelerometers and velocimeters, they synchronised with the motion of the bus so that when it turned or bounced, the view out of the window did as well.

"We had a Mars rover and a colony that the kids could look at as they were driving past," says Fosner. "Then three quarters of the way through we had a sandstorm. There was 400W surround sound, so the windows on the bus were rattling while the view outside the bus was totally dark with red sand for 10 to 15 seconds."

"We got a lot of compliments about how different it was. A lot of people have experienced VR, but they hadn't seen anybody do a large-scale VR installation like this before. Once the windows switched on they were just screaming out loud, even the adults."

[www.fieldtriptomars.com](http://www.fieldtriptomars.com)

# ENTERTAINMENT

VR can be lighthearted as well as educational



Engineers test Microsoft's HoloLens on NASA's Weightless Wonder C9 jet

## Universe Sandbox 2 Oculus, Vive; \$24.99

This physics-based space simulator gives you control over the Universe. The game creates simulations of planetary systems, stars and even galaxies, then gives you free rein to alter them. You can launch planets into new orbits or fire moons into the Earth (pictured), then sit back and watch as the effects of your chaos unfolds around you. The game is in early release, so is still being worked on, and some



of the tutorials are currently missing. However, experimenting with what the game can do provides much fun.

This particular VR game includes a desktop version, where you can craft your own detailed planetary systems. You can then load these into the VR version, allowing you to fly through them, hopping from planet to planet to get a better look at your creation.

<http://universesandbox.com/vr>

## SPACE TRAVEL'S VIRTUAL FUTURE

Whether it's on the ground or on the ISS, VR is helping to further space science

When astronaut Tim Peake ventured out into space for the first time, it was not his first ever experience of a spacewalk – Peake had performed the task dozens of times in virtual reality.

Virtual reality has been part of astronaut training for years, but as headsets get cheaper, they can be found in more departments around NASA and ESA. Building components in VR allows engineers to examine and test their work without the need to manufacture expensive prototypes. Meanwhile, planetary geologists are no longer stuck looking at flat images of distant worlds. VR allows them to create mock-ups of the territory they are investigating, which they can then walk around and examine in detail.

The lightweight headsets are heading even further afield, into space itself. In 2015 NASA flew some Microsoft HoloLens headsets – which project images over the wearer's view of reality – to the ISS. The aim is to use the technology to train astronauts while in orbit, create helpful overlays to aid in complex procedures, and eventually control robotic helpers on the surfaces of other planets from orbit. Alternatively, they can be used for fun, as Tim Peake and Scott Kelly showed – they used their headsets to play Space Invaders while off duty. **S**



Take in the view from low-Earth orbit in Home

## Home: A VR Spacewalk

Oculus, Vive; Free

Inspired by Tim Peake's spacewalk in 2016, this game challenges you to travel outside the ISS and inspect a damaged solar array. But a strike by some orbital debris sends you spiralling into space, and you have to get yourself back to safety. What really makes this experience is looking over to see our home planet passing beneath you. <http://rewind.co/portfolio/bbc-home>

## The Martian VR Experience

Oculus, Vive; £7.99

Based on the hit movie of Andy Weir's best-selling book, The Martian VR Experience lets you take the role of astronaut Mark Watney, who has been stranded on the Red Planet. You have to do some potato farming, drive a Martian rover, and then fly through space to your rescue. These short sections are cut together with clips from the movie, creating a VR trailer. [www.foxvrperiences.com](http://www.foxvrperiences.com)



Heading towards rescue in The Martian VR Experience