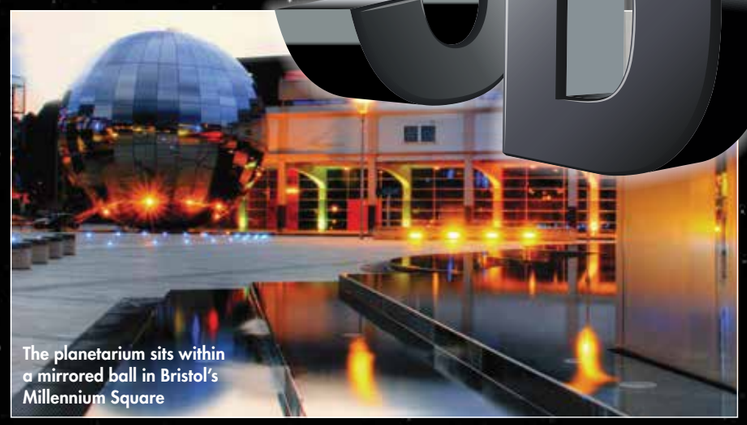
The 3D planetarium allows viewers to 'fly' through the cosmos

THE UNIVERSE IN 3D

At-Bristol's planetarium has recently been updated, making it one of the highest resolution 3D cinemas in the world, writes **Elizabeth Pearson**



The planetarium sits within a mirrored ball in Bristol's Millennium Square

Flying through the rings of Saturn, particles of ice and rock spinning around you, is a fantasy many astronomers have had while staring at the distant planet through an eyepiece. But few thought they would ever get to see it. Yet this was just one of the sights I was treated to when I paid At-Bristol's newly updated 3D planetarium a behind-the-scenes visit.

The flight was part of their seasonally updated stargazing programme, showing what can be seen in the sky that night. But rather than simply walking viewers through the constellations and planets, the 3D planetarium allows you to fly through the Solar System, and visit the stars and planets up close as they appear to leap from the screen towards you.

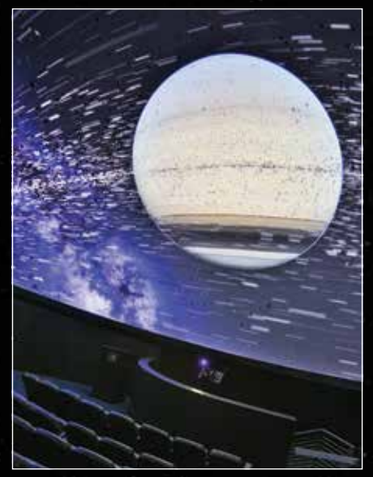
"The Universe is 3D," says Lee Pullen, At-Bristol's planetarium manager. "Planets aren't circles, they are spheres. Planets, orbital paths, the structure of the Solar System – it just works better in 3D."

The magnificent views are generated by two 4K projectors – one covering the front of the dome, the other covering the back – transmitting at 120 frames per second. This is double what the eye can see, but it's needed because the system uses active 3D. "The glasses have infrared sensors that sync up with the whole system," says Pullen. "The lenses are LCD screens that turn off and on incredibly fast."

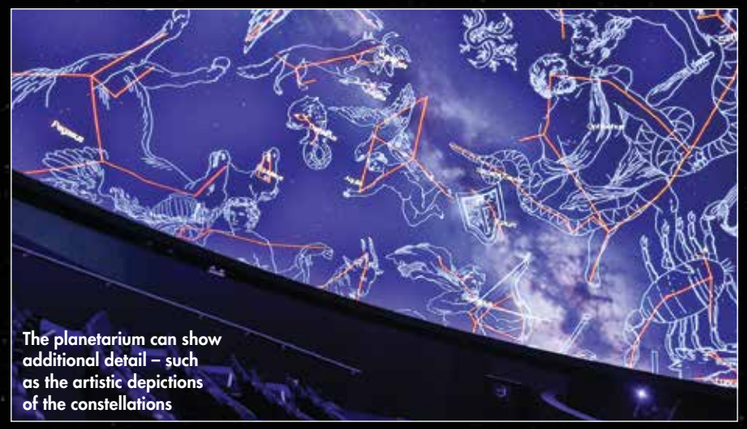
The flickering lenses are timed with the images on the dome flashing back and forth between the left and right eye images to create the illusion of 3D.

"The resolution combined with the high frame rate means that every second we put out 1.6 billion pixels onto the dome, which we think makes us the highest resolution cinema in the UK," says Pullen.

TIM MARTIN X 4, @BRISTOL, RICHARD TAYLOR JONES



▲ While flying through the rings of Saturn, the particles appear to swirl around your head



The planetarium can show additional detail – such as the artistic depictions of the constellations

▲ This computer system allows complete control over the planetarium, and the Universe

This impressive projection system is hooked up to an equally impressive software suite. The shows put on at the dome are not just pre-rendered films. They are controlled by the presenters on the fly as they go through the show. The entire Galaxy and beyond is simulated in the planetarium software, requiring 17 computers and 15 graphics processors to run.

Flight of the navigator

"It's not just a film," says Seamus Foley, the planetarium media production officer. "It's essentially a huge videogame of the Universe. What you see is the presenter pressing buttons on an iPad, but they could potentially go anywhere in the Universe at any time. I think that's one of the great things about planetariums. You can say fly to Saturn, and you fly to Saturn from anywhere in the Universe."

I was lucky enough to be able to take control of the planetarium, making a jaunt to the Helix Nebula in Aquarius. It was here the combination of 3D and high resolution really became apparent.

▲ The planets are not computer generated – they are based on real spacecraft data

Rather than simply seeing a flat image of the nebula, the program used the latest observations and simulations to create a 3D model we were able to fly though.

The team at At-Bristol hope that one-day they can team up with researchers of all disciplines to help them visualise their data, so they can be part of making scientific discoveries, as well as teaching about them.

"In the future we might be able to stream 4K frames in real time from the University of Bristol nearby, so you can have a supercomputer processing visualisations of molecular simulations, for example, and it turns up in the planetarium," says Foley.

The planetarium software already keeps abreast of the latest advances in space science – it is regularly updated with new observations. When New Horizons flew past Pluto, the team at the dome were among the first to see the 3D renderings of the dwarf planet.

During the tour of our Solar System, we landed on Olympus Mons on Mars, but the landscapes surrounding us weren't computer-generated estimates of what the surface should look like: they were based on the latest scans of the planet.

Over the course of this year around 130,000 people will have sat under the dome and landed on Mars or flown through the rings of Saturn as the dome takes them to places they have never seen before. The prime purpose of the planetarium is to educate, to open up people's minds to the wider Universe that hides in the night sky.

"We have people coming out and they are absolutely buzzing," says Pullen. "Today one lady came out of the show and confessed she'd found the experience so emotional that she'd wept tears of joy in the show. Often people are just amazed. They had no idea that there was so much out there to be able to find."

Find out more about the planetarium and the At-Bristol science centre at **www.at-bristol.org.uk**

ABOUT THE WRITER

Dr Elizabeth Pearson is *BBC Sky at Night Magazine*'s news editor. She gained her PhD in extragalactic astronomy at Cardiff University.