INSTITUTE OF ASTRONOMY
PUBLIC OPEN EVENING

— 6 November 2019 —

New Dark Energy Instrument aims to map Universe

Kitt Peak in Arizona, home to the new Dark Energy Spectroscopic Instrument. Credit: NOAOAURA/NSF

A brand-new robotic instrument, which is aiming to map many millions of galaxies in a quest to better understand dark energy, has been switched on for the first time.

The device is called the "Dark Energy Spectroscopic Instrument", and has been installed on Kitt Peak in Arizona.

The instrument has the extraordinary ability to measure the distances to 5000 separate galaxies and quasars at the same time. It does this through a remarkable feat of engineering, in which 5000 individual fibre-optic cables are robotically positioned around the instrument to match the layout of galaxies in the night sky. Each optical fibre (which is about the width of a human hair) can collect the light from a single source, and send the data to waiting computers.

In total, the instrument is expected to measure the positions of 35 million galaxies and 3 million quasars, lying up to 11 billion light years away. Using this information, astronomers will be able to make a precise 3D map of the Universe. This, in turn, will allow astronomers to understand how mysterious 'dark energy' has changed over the course of the Universe's history.

Dark energy is the name for the mysterious force which is speeding up the expansion of the Universe, but as yet astronomers do not fully understand it. By measuring these galaxies -- and, more importantly, measuring how fast they are moving -- astronomers can calculate whether the strength of dark energy has stayed the same over time (which our standard theories of cosmology expect), or whether it is changing -- which would be more of a surprise, and would require new theories.

TONIGHT'S SPEAKER

Matt Auger

100 years of gravitational lensing

Our weekly welcome

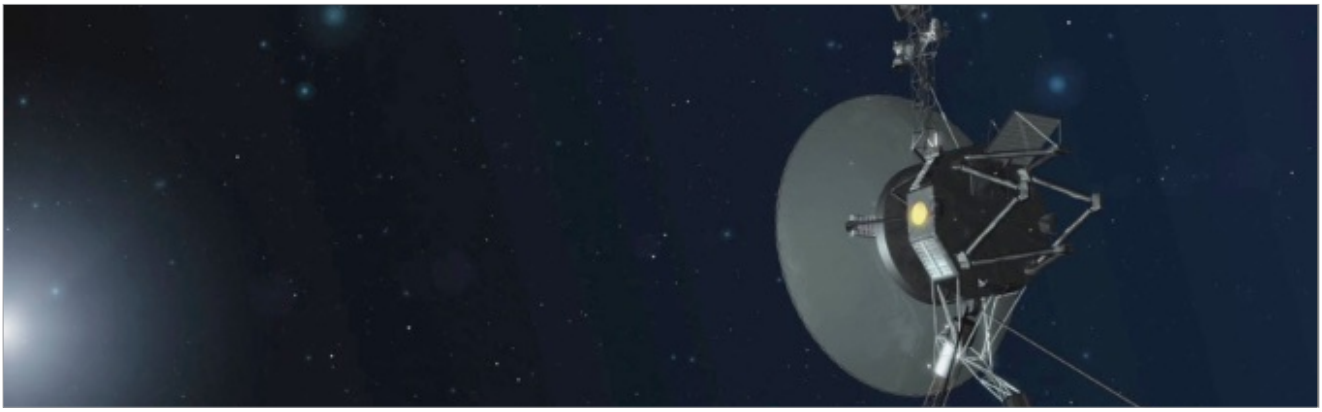
WELCOME to our weekly public open evenings for the 2018/19 season. Each night there will be a half-hour talk which begins promptly at 7.15pm. Please note that the talk will be recorded and archived for online streaming.

The talk is followed by an opportunity to observe if (and only if!) the weather is clear. The IoA's historical Northumberland and Thorrowgood telescopes, along with our modern 16-inch telescope, will be open for observations. In addition, the Cambridge Astronomical Association will provide a floorshow outdoors on the Observatory lawns, relaying live images from their telescopes and providing a commentary. If we're unlucky and it's cloudy, we'll offer you a conciliatory cup of tea after the talk (with perhaps some more astro-information in the lecture theatre for those who want to stay on).

If you have any questions, suggestions or comments about the IoA Open Evenings please contact Matt Bothwell at bothwell@ast.cam.ac.uk.

The talk schedule for this term can be viewed at: www.ast.cam.ac.uk/public

Voyager 2 probes interstellar space



An artist's depiction of Voyager 2 heading our into interstellar space. Image: NASA/JPL-Caltech

The Voyager probes, launched in the 1970s, have since become the most distant human-made objects. Travelling for 41 years at around 60,000 miles per hour, the spacecraft have recently left our Solar System. This boundary is far beyond the orbit of Pluto, and is defined as leaving the 'bubble' of the Sun's influence (known as the heliosphere) and heading into true interstellar space.

Voyager 1 left the Solar System in 2013, but Voyager 2, having taken the scenic route around the Solar System, took 6 more years.

Now, several new papers published in *Nature Astronomy* have revealed more information than ever before about the cosmic shoreline that separates our home starsystem from the coldness of interstellar space.

As the probe crossed the heliopause, there was a sudden decrease in particles from the Sun, and an equally sudden increase in high energy 'cosmic rays'.

Interestingly, comparing the data from the two Voyager probes exiting the Solar System tells us the shape of the Sun's 'bubble'. “It implies that the heliosphere is symmetric” said Bill Kurth (University of Iowa), who co-authored one of the studies. “That says that these two points on the surface are almost at the same distance.”

The two Voyager probes are expected to power down in the mid-2020s, at which point they will continue their journey around the Milky Way for many billions of years to come.

Astronauts to spend 2 weeks on Moon

NASA has said that they plan to send astronauts to the Moon to stay for two weeks by 2030. This would be around five times longer than the previous record, which was just a couple of days.

Scientists Niki Werkheiser and John Connolly discussed the plans in a meeting of the NASA Lunar Exploration Analysis Group in late October.

Aiming to extend the stay on the Moon is a critical part of a long-term plan to build a permanently staffed moonbase in the future.

Speaking at the conference John Connolly said: 'We are going to do some testing for Mars on the Moon, but we are also looking at a long-term lunar surface presence. We are, no kidding, really starting to plan this mission. This is getting real."

Transit of Mercury on 11 November

We are holding a special daytime event to view the transit of Mercury on 11th November 2019, from 12:30pm. At the IoA we will have a selection of instruments that will make it possible to see this happening in real time using a number of different methods. We open our doors at 12:30pm, and will observe the transit all day until sunset. This will be an all-afternoon event, so feel free to drop in any time. The next chance to see this will be in 2032!

Joke of the Week

How many astronomers does it take to change a lightbulb? One, but you can only get the really good bulbs in Chile.