

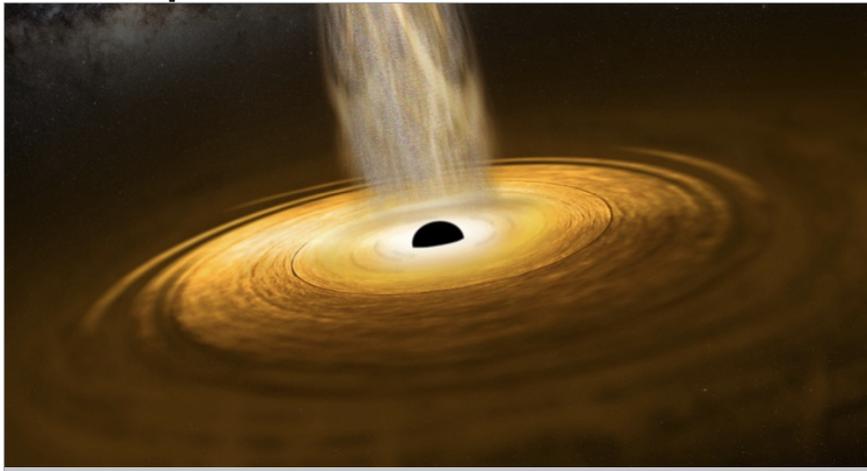


# INSTITUTE OF ASTRONOMY PUBLIC OPEN EVENING

— 22 JANUARY 2020 —



## Astronomers use echolocation to map black hole



*An artist's impression of the black hole*

Material falling into a black hole casts X-rays out into space – and now, for the first time, IoA researchers (using ESA's XMM-Newton X-ray observatory) have used the reverberating echoes of this radiation to map the dynamic behaviour and surroundings of a black hole itself.

Most black holes are too small on the sky for us to resolve their immediate environment, but we can still explore these mysterious objects by watching how matter behaves as it nears, and falls into, them.

As material spirals towards a black hole, it is heated up and emits X-rays that, in turn, echo and reverberate as they interact with nearby gas. These regions of space are highly distorted and warped due to the extreme nature and crushingly strong gravity of the black hole.

For the first time, researchers have used XMM-Newton to track

these light echoes and map the surroundings of the black hole at the core of an active galaxy.

“Everyone is familiar with how the echo of their voice sounds different when speaking in a classroom compared to a cathedral – this is simply due to the geometry and materials of the rooms, which causes sound to behave and bounce around differently”, explains William Alston from the Institute of Astronomy, University of Cambridge, and lead author of the new study.

“In a similar manner, we can watch how echoes of X-ray radiation propagate in the vicinity of a black hole in order to map out the geometry of a region and the state of a clump of matter before it disappears into the singularity. It's a bit like cosmic echo-location.”

*(Adapted from an ESA press release.)*

### TONIGHT'S SPEAKER



Prakash Gaikwad

The science behind this year's Nobel prize

### Our weekly welcome

**W**ELCOME to our weekly public open evenings for the 2019/20 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](mailto:bothwell@ast.cam.ac.uk).

The talk schedule for this term can be viewed at: [www.ast.cam.ac.uk/public](http://www.ast.cam.ac.uk/public)

# Earth's oldest meteorite impact found



*The Yarrabubba area, as seen from the International Space Station*

Scientists have found the oldest impact crater on Earth, which dates back over 2.2 billion years -- meaning the asteroid struck when the Earth was just half of its current age.

The location is called Yarrabubba, in Western Australia, and is home to the long-eroded remains of a 70km-wide impact crater. The crater isn't actually visible to the eye, as 2.2 billion years of erosion has destroyed most of the features. The massive meteorite site was only found (in

2003) when scientists noticed that ancient minerals (including quartz grains) showed signs of being shocked by a violent impact.

The team (led by Timmons Erickson at the NASA Johnson Space Center) used the radioactive decay of uranium to place a very precise date on the impact 2229 million years ago (plus or minus five million years). "When the age came back at 2.229 billion years, that blew our hair back," geochemist Aaron Cavosie from Curtin University in

Australia told ScienceAlert.

Interestingly, given the extent and timing of the ancient meteorite impact, it is a good candidate for the event that ended an ice age. "The age of the [crater] corresponds pretty precisely with the end of a potential global glacial period," said Professor Chris Kirkland, at Curtin University. "So the impact may have had significant changes to our planetary climate."

## Goodbye to the Spitzer Space Telescope



NASA's legacy infrared space telescope 'Spitzer' is to officially retire in 2020.

Launched in 2003, the telescope has lasted much longer than its expected 5-year mission, though it has been on its last legs for a while now, with two of three onboard instruments failing over the years. NASA will officially shut down the observatory on January 30th, 2020.

Due to a mismatch between the

solar panels and the communication software, Spitzer can't talk to Earth and charge its batteries at the same time. Right now, it has to alternate between sending data to Earth and recharging -- and, as the telescope drifts further away from Earth, this gets harder and harder.

Spitzer has done a lot of groundbreaking science over the years (being classed alongside

Hubble as one of NASA's 'great observatories').

Some of Spitzer's highlight science results include...

- The discovery of seven Earth-like planets around a single star (the TRAPPIST-1 system).
- Images of some of the earliest galaxies in the Universe, over 13.4 billion years ago
- The first ever 'direct detection' of an exoplanet
- Identification of two of the most distant supermassive black holes ever discovered
- The revelation that Saturn has a massive invisible ring, 170 times wider than the planet!

## Joke of the Week

I just met else someone who doesn't know what a "globe" is! It's a small world...