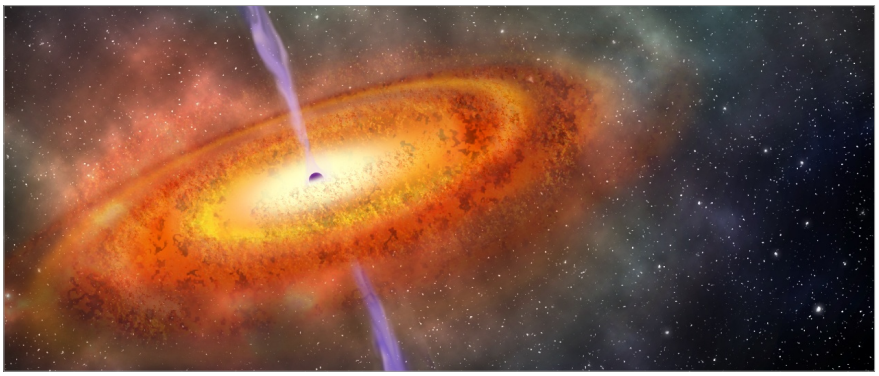
INSTITUTE OF ASTRONOMY
PUBLIC OPEN EVENING

— 25 JANUARY 2023 —



Cambridge Masters' student discovers two new quasars

Quasars (supermassive black holes feeding on gas at the center of galaxies) were first discovered in the 1960s and have since been used to help us understand how galaxies evolve. They are some of the brightest objects in the Universe and can therefore be seen from billions of light years away. Since light from quasars takes billions of years to reach Earth, studying them can provide astronomers with insights into what the early Universe was like.

The distance light has travelled is indicated by cosmological redshift, the phenomenon by which travelling light waves are stretched by the expansion of space itself. Greater redshift means a greater distance travelled. Therefore to understand the earliest stages of the Universe, astronomers are most interested in high-redshift quasars.

Cambridge Masters' student Alex Byrne used machine learning - a method in which artificial intelligence teaches computers to process data in a similar way to the human brain - to discover two such quasars. Previous surveys identified quasars by looking at the wavelength of light emitted and rejecting sources with short wavelengths as high-redshift quasars are not expected to emit blue light. However, researchers have suggested that this selection criteria may lead to rejecting high-redshift quasars that are hidden behind massive nearby galaxies. These quasars, referred to as lensed high-redshift quasars, appear bluer due to the bright galaxies obscuring them."Honestly I wasn't really expecting our method to find anything, but it suggested two candidates, which we had a closer look at with the Gemini South telescope in Chile" said Byrne. "To my surprise, turns out both are quasars! We're currently in the process of writing proposals to other telescopes to get a closer look at them, hopefully confirming them as the second and third lensed high-redshift quasars to ever be discovered!"

TONIGHT'S SPEAKER

Maggie Goulden

How to make a planet

Our weekly welcome

WELCOME to our weekly public open evenings for the 2022/23 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).

News stories written by Natasha Goodman. 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.public.ast.cam.ac.uk

JWST finds ingredients for life in dark, cold cloud in space

An international team of researchers used JWST to produce an in-depth inventory of the deepest, coldest ices measured to date in a molecular cloud. The cloud, known as Chamaeleon I, is a star forming region around 500 light years away. As light from stars passed through the cloud it interacted with the atoms and molecules present. Since different atoms absorb different wavelengths of light, researchers could determine the cloud's ice composition from the spectrum observed.

In addition to simple ices such as water and carbon dioxide, the team identified complex organic molecules including methanol. The team were also able to find evidence for molecules more complex than methanol, proving for the first time that complex molecules form in the cold depths of molecular clouds before stars are born.

“Our results provide insights into the initial, dark chemistry stage of the formation of ice on the interstellar dust grains that will grow into the centimeter-sized pebbles from which planets form in disks,” said Dr Melissa McClure, an astronomer at Leiden Observatory in the Netherlands, who is the principal investigator of the observing program and lead author of the paper describing this result. “These observations open a new window on the formation pathways for the simple and complex molecules that are needed to make the building blocks of life.”

Understanding which molecules crucial to the development of life are incorporated into newborn planets, and in what quantities, will make it possible to assess the future habitability of these young worlds.

Why do we need both Hubble and JWST?

Since the first images from JWST were released in July 2022, many have been comparing them to similar images taken by the Hubble Space Telescope. With images from JWST appearing crisper and more detailed, some may be wondering whether Hubble is now useless.

In fact the opposite is true - not only is Hubble still making discoveries, astronomers are looking into extending its lifetime and potentially have it running into the 2030s. “There’s still tons of science to be done with Hubble,” says Dr Beth Biller, an astronomer at the University of Edinburgh, who chairs a committee representing scientists who use Hubble.

One of Hubble's main strengths is the wavelengths it can detect. While JWST detects infrared wavelengths emitted by distant galaxies, Hubble was optimised for shorter wavelengths. This optimisation allows Hubble to achieve the same resolution in visible light that JWST does in infrared. Combining observations from the two telescopes can therefore result in spectacular, broad-spectrum views.

Hubble's ability to detect high energy UV rays - the same rays emitted from exploding stars - is also a unique asset. Earth's atmosphere absorbs most UV light, a process that protects us from being exposed to harmful levels of radiation but also makes it near impossible to study UV-emitting sources from the ground. Being located in space means Hubble does not have to deal with Earth's atmosphere, making it ideal for imaging young bright stars and supernovae.

Astronomers are currently working on coordinating Hubble and JWST observations to produce a broader and more detailed picture of the cosmos.

Joke of the Week

The other day I was fined for sending my cat into space. It was a cat astro fee.