INSTITUTE OF ASTRONOMY
PUBLIC OPEN EVENING

— 11 JANUARY 2023 —

Comet C/2022 E3 (ZTF) may soon be visible to the naked eye

For the first time in 50,000 years, comet C/2022 E3 will pass by the inner solar system and may even be visible to the naked eye.

The comet will reach its perihelion (the point at which it is closest to the sun) on Thursday 12th January. It will then make its closest approach to Earth on Wednesday 1st February, at which point its brightness is expected to peak. The comet will be within 0.28 AU of Earth (where one AU, or astronomical unit, is the average Earth-Sun distance) and will hopefully be visible to the naked eye. Unfortunately, the bright, long tail produced as heat from the sun evaporates the comet's gases is unlikely to be visible without a telescope. However, C/2022 E3 should still make for a memorable sight on its own, and random outbursts are always a possibility.

On January 12th, C/2022 E3 should be visible to observers in the Northern Hemisphere a few hours before dawn, near the constellation Corona Borealis. With a magnitude of 7 it will be easily visible with a small telescope or binoculars. With the Moon in the sky it may be difficult to spot C/2022 E3, however on the week beginning January 16th it may be possible to spot the comet between midnight and 2 am, before the moon rises. During this time, however, C/2022 E3 will be close to the horizon making it best viewed from high ground.

By Monday 23rd January C/2022 E3 will be much clearer in the early-morning sky without the Moon as it travels through Boötes towards Draco. On Tuesday 31st January the comet will cover 12 arcseconds per minute, so astrophotographers should use shorter exposures to capture sharp details.

Around this time it may brighten to a magnitude of 6, making it visible to the naked eye under good conditions.

TONIGHT'S SPEAKER

Yinuo Han

Stellar Fireworks: A journey through the spirally dust of massive binary

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

Colliding neutron stars reveal mysteries of extreme matter

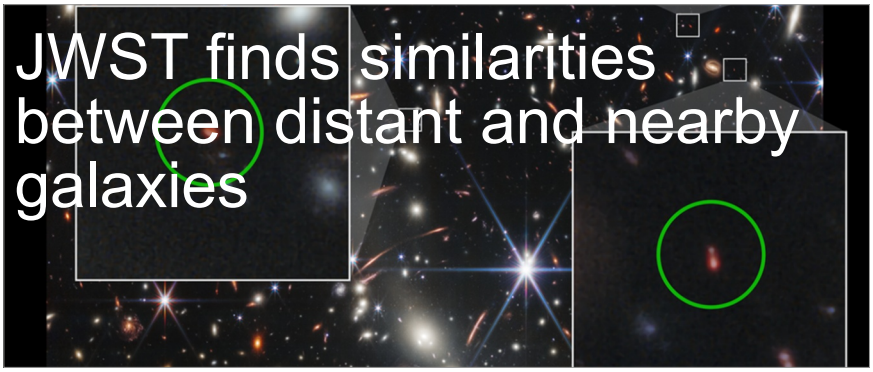
Collisions between neutron stars involve densities 10^15 times that of water, temperatures ten million times hotter than the surface of the sun and magnetic fields ten billion times greater than that of the strongest magnet produced on Earth. These extreme conditions result in strange behaviour, including the possibility that quarks (fundamental particles making up protons and neutrons) could become unbound and form a quark soup. The only other time this is thought to have occurred is a fraction of a second after the Big Bang.

With conditions this extreme, even the most powerful computers cannot calculate how matter should behave before and after these collisions.

When two neutron stars merge they are thought to produce a new neutron star that rotates between 1,000 and 2,000 times a second while undergoing oscillations, but until recently evidence of these oscillations have not been found. Dr Cecilia Chirenti and her colleagues recently reported that they could detect signatures of these oscillations in gamma ray observations. Knowing the oscillation frequency would reveal the compactness of the neutron star (similar to how the pitch of a drum depends on its size). This compactness is crucial to determine which equations of state best describe the matter in a neutron star merger.

If Chirenti and colleagues' observations are confirmed independently, their findings will help analyse the extreme matter that is key to solving one of the great unsolved problems in physics.

JWST finds similarities between distant and nearby galaxies



In 2009, volunteers taking part in the citizen science project Galaxy Zoo discovered a new class of galaxy. Galaxies in this class are small, round and distinctly green – resulting in the name "green peas". They are unusual, as despite their small size - (a typical green pea galaxy has a diameter of 5,000 light years, which is only 5% that of the Milky Way) - they have very high rates of star formation. Their intense activity and relative proximity to the Milky Way means green peas provide a unique local laboratory in which processes involved in the formation and evolution of galaxies can be studied.

In 2022, researchers used JWST to produce the deepest and sharpest infrared image of the distant universe yet seen. Thousands of galaxies located behind a cluster known as SMACS 0723 were observed. The captured galaxies included three compact objects that resembled green peas. Their spectra showed the same oxygen, hydrogen and neon emission characteristic of local green peas.

"We're seeing these objects as they existed up to 13.1 billion years ago, when the universe was about 5% its current age," said Goddard researcher Dr Sangeeta Malhotra. "And we see that they are young galaxies in every sense – full of young stars and glowing gas that contains few chemical products recycled from earlier stars. Indeed, one of them contains just 2% the oxygen of a galaxy like our own and might be the most chemically primitive galaxy yet identified".

Joke of the Week

Two random variables were talking in a bar. They thought they were being discrete, but I heard their chatter continuously.