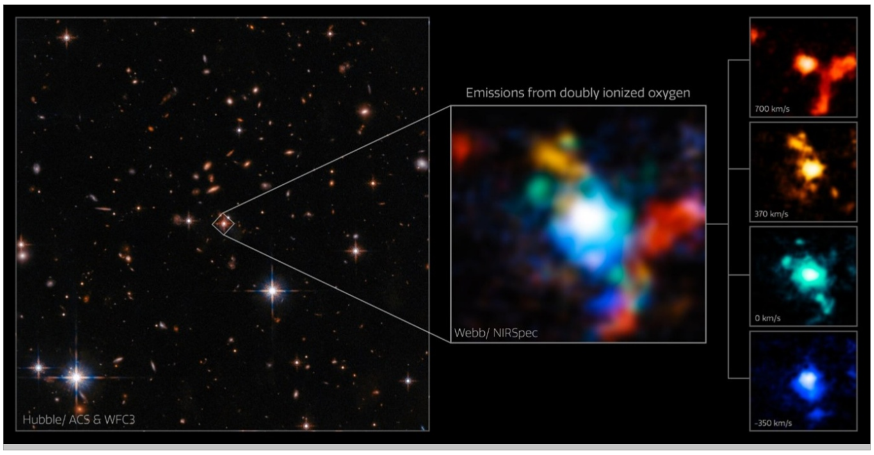
INSTITUTE OF ASTRONOMY
PUBLIC OPEN EVENING
— 26 OCTOBER 2022 —

JWST reveals 11.5 billion year old cosmic knot



JWST has been used to image a 11.5 billion year old quasar surrounded by a cluster of galaxies still undergoing formation.

Quasars are compact objects, located in the centres of galaxies, that are powered by material falling into supermassive black holes. They are the most luminous entities in the known Universe and can outshine entire galaxies. Typically quasars emit light in many wavelengths, allowing them to be viewed by X-ray, optical and infrared telescopes.

What makes quasar SDSS J165202.64+172852.3 unique is the fact that, unlike most other quasars, it is extremely red. This redness is in part due to redshift (the process by which the wavelength of light from a distant object is stretched as the Universe expands). Because of this, the quasar is best observed in infrared – a task which JWST is perfect for thanks to its special gold-coated mirrors.

Previous observations of the quasar had led to speculations that its host galaxy could have merged with an unseen companion. With the data obtained by JWST, a team of astronomers, led by Dr Dominika Wylezalek of Heidelberg University in Germany, were able to confirm that there were not one, but three galaxies surrounding the quasar.

Mapping the motions of the material surrounding SDSS J165202.64+172852.3 led to the conclusion that it was part of a dense knot of galaxy formation. “This may eventually help us understand how galaxies in dense environments evolve… It’s an exciting result.” Said Dr. Wylezalek in a press release.

In addition to the three observed galaxies, the team suspect that there could be several more galaxies remaining to be found. Future observations will help build a better picture of the early Universe.

TONIGHT'S SPEAKER

Sandro Tachella
Gravitational lensing: a window to the invisible Universe

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).

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

Simulation shows Moon forming in mere hours

Image taken from NASA's Ames Research Center

Around 4.5 billion years ago Earth was hit by a Mars-sized object named Theia, which led to the formation of the Moon. Traditionally, theories have suggested that the Moon formed over the course of several months from the debris produced by the collision. However the precise details were unclear.

The most popular models included one in which the Moon was suggested to form mostly from debris composed of Theia. But this model fails to explain why the Moon has such a similar composition to Earth. Another leading model proposed that the Moon was formed from rock vaporised by the collision. This explains the similar compositions, but results in the Moon having a very different orbit to the one observed today.

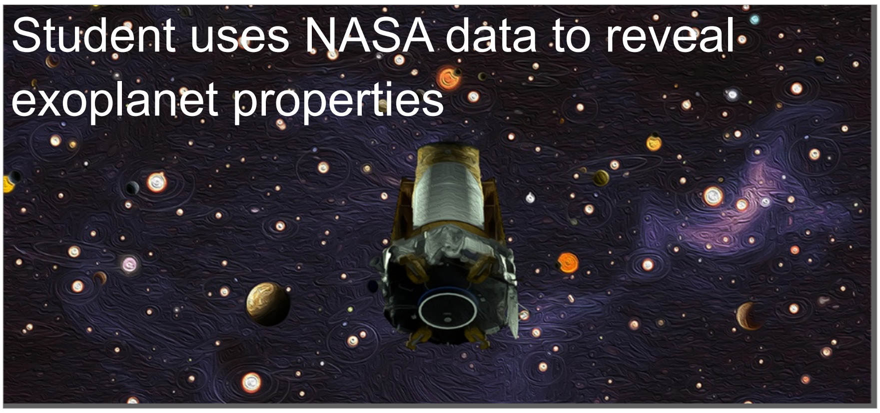
Researchers hoped that with an incredibly high resolution simulation it would be possible to shed some light on this mystery. What they found was a completely new theory – the idea that the Moon formed within a few hours of Theia colliding with Earth.

As well as providing explanations for the composition and orbit of the Moon, the theory could be the key to understanding other properties of the Moon – such as its thin crust.

As Vincent Eke of Durham University explains "The more we learn about how the Moon came to be, the more we discover about the evolution of our own Earth."

In learning more about this (and other) collisions we could be getting closer to understanding how a planet could evolve to be habitable like Earth.

Student uses NASA data to reveal exoplanet properties



In 1992 the first exoplanet (a planet outside our solar system) was spotted. Since then over 5,000 additional exoplanets have been discovered, resulting in a wealth of data. And yet, despite this, many details of these planets remain unknown, such as their mass and chemical composition. In an attempt to uncover some of these details, University of Chicago undergraduate Jared Siegel and his advisor, astrophysicist Leslie Rogers, spent six months analysing data from NASA's Kepler telescope.

This data consisted of many light curves from distant stars, which show dips in brightness whenever light is blocked out – such as by a planet passing in front. By measuring the time for which a star's light is dimmed periodically it is possible to determine the time it takes for a planet to complete an orbit. However, a planet's orbit may be altered if it experiences a gravitational pull from another planet orbiting the same star. The more massive this other planet, the greater its pull and the more the orbit will be altered.

Siegel and Rogers used this idea combined with statistical methods to set upper limits on the masses of 50 exoplanets. This allowed them to place constraints on what these planets could be made of. For instance, a planet with a similar size to Earth but a much lower mass cannot be composed of Earth-like material. Details like this help scientists understand the distribution of exoplanet types, which helps to predict how common Earth-like planets are.

Joke of the Week

I used to have an addiction to space puns, but I was able to over-comet.