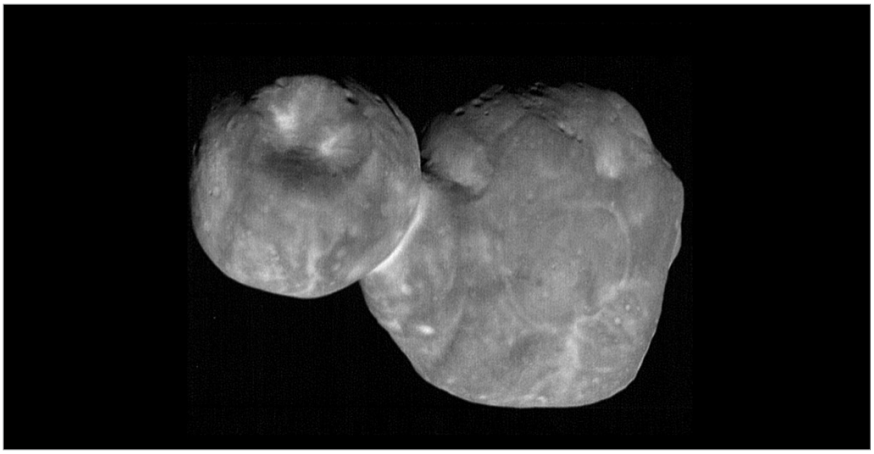
INSTITUTE OF ASTRONOMY
PUBLIC OPEN EVENING

— 26 February 2020 —

Organic molecules found on Arrokoth



Arrokoth (previously known as Ultima Thule) is a distant world. Far out in the frozen Kuiper belt, it orbits nearly 7 billion kilometers from the Sun, where the temperature is close to absolute zero. It is also the most distant object ever visited by a spacecraft, after New Horizons conducted a flyby of the object in early 2019.

Ever since the flyby, New Horizons has been sending the data back to Earth (which takes six hours to arrive, at the speed of light!). The initial reports sent back a small amount of data, but after a year of data transfer we now have a much clearer understanding of Arrokoth's geology, chemistry, and history. Three new papers published in the Journal Science this week detail the new findings.

One highlight is the confirmation that the double-lobed object (see photograph above) is the product of a gentle, low-speed merger in the early Solar System.

New spectroscopic data also suggest that Arrokoth is covered in 'tholins', organic molecules which can be the raw materials for prebiotic chemistry (the non-living chemicals that eventually make up the chemistry of life).

Lowell Observatory astronomer Will Grundy (project lead on the analysis of Arrokoth's chemistry), said in a press conference that these organic compounds could have formed in the Solar Nebula, the fragment of a gas cloud that formed our Solar System. Or they could be even older still, dating back to the molecular cloud that formed our Sun. It is hoped that a better understanding of the origins of these organic molecules, carried in a time capsule like Arrokoth, can give us clues to the history of our own Earth.

TONIGHT'S SPEAKER

Andy Fabian

Astronomy from the International Space Station

Our weekly welcome

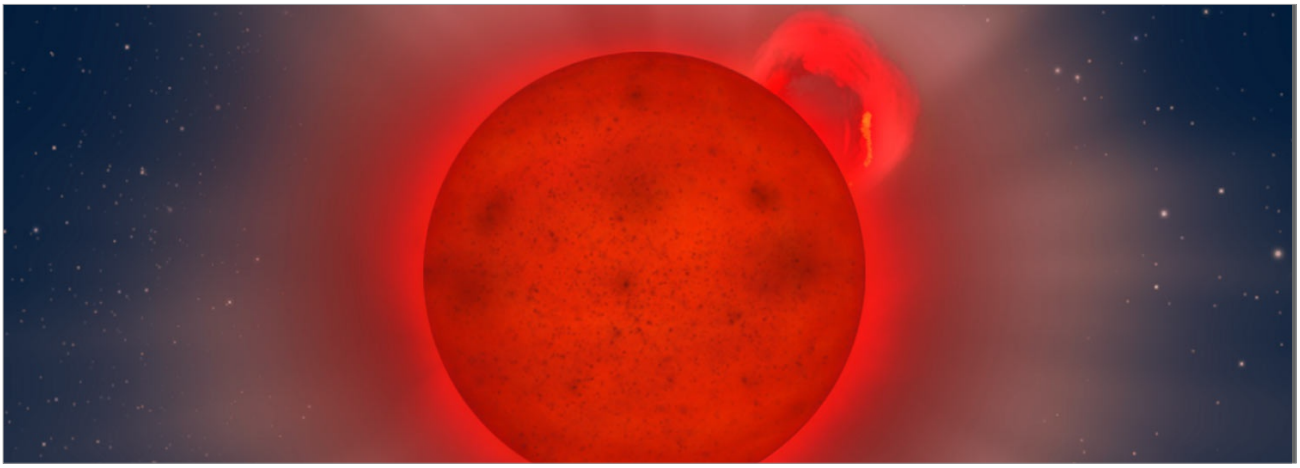
WELCOME to our weekly public open evenings for the 2019/20 season. Each night there will be a half-hour talk which begins promptly at 7.15pm. Please note that the talk will be recorded and archived for online streaming.

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.

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

Tiny star produces huge X-ray flare



A tiny star, known as J0331-27, has erupted producing a gigantic stellar superflare more than 10 times as powerful as anything our Sun could possibly produce.

The tiny star is classed as an 'L-dwarf' star, and is just eight percent the mass of the Sun (and only just scrapes over the line to be defined as a star at all!). As such, astronomers are surprised that the tiny body was able to produce such an extreme burst of radiation.

The strange flare also went unnoticed for over a decade, lying in the archives of the European Space Agency's XMM-Newton X-ray observatory.

So what causes such a small star to have such a violent outburst? Such extreme events are generally supposed to require high temperatures which interact with the magnetic fields on the surfaces of stars -- and dwarf stars like J0331-27 are far too cool for that.

"This is the most interesting scientific part of the discovery, because we did not expect L-dwarf stars to store enough energy in their magnetic fields to give rise to such outbursts," said Beate Stelzer, co-author on the paper.

Even stranger, this flare was the only one observed during the 40-day observation period. And normally, we would expect a flare like this to be part of an ongoing storm.

“The data seem to imply that it takes an L dwarf longer to build up the energy, and then there is one sudden big release,” says Stelzer.

Katherine Johnson, 1918-2020

Katherine Johnson, the American mathematician whose calculations of orbital mechanics were critical for NASA's early space missions, has died at the age of 101.

Nasa announced her death on Twitter, saying it was celebrating her life and honouring "her legacy of excellence that broke down racial and social barriers", noting her "historical role as one of the first African-American women to work as a NASA scientist".

In her career, Johnson co-authored 26 scientific papers, in which she calculated trajectories, launch windows and emergency return paths for early NASA spaceflights, as well as paths for the Apollo Lunar Module and command module on flights to the Moon.

Nasa administrator Jim Bridenstine described Ms Johnson as "a leader from our pioneering days".

"Ms Johnson helped our nation enlarge the frontiers of space even as she made huge strides that also opened doors for women and people of colour in the universal human quest to explore space," he said in a statement.

"Her dedication and skill as a mathematician helped put humans on the Moon and before that made it possible for our astronauts to take the first steps in space that we now follow on a journey to Mars."

Joke of the Week

As a child I was obsessed with the difference between cosine and sine. But as I got older I realised it was just a phase.