



INSTITUTE OF ASTRONOMY PUBLIC OPEN EVENING

— 22 MARCH 2023 —



TONIGHT'S SPEAKER



Jane Rigby

The Webb Telescope's New Era in Astronomy

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

Next generation Event Horizon Telescope aims to video black holes



In 2019 the Event Horizon Telescope (EHT) collaboration produced the first image of a black hole. Now the next generation Event Horizon Telescope (ngEHT) collaboration aims to produce high-quality videos of black holes.

Larger telescopes collect more light and allow for greater detail to be observed. In order to produce images of black holes we need a telescope the size of Earth. To achieve this the EHT uses multiple telescopes scattered around the globe to form a virtual Earth-sized telescope in a process known as very long baseline interferometry.

The 2019 image was created using existing telescopes at six sites. The ngEHT collaboration is now looking into optimal sites to build new telescopes to increase the number of sites to 20. This collaboration requires over 300 experts in natural sciences, social sciences and humanity - making it the first large physics collaboration to combine perspectives from

these three groups.

It is not enough to simply obtain data, this data must also be analysed and have conclusions drawn from it. These conclusions then need to be presented to the public in a way that will allow them to be understood without knowing all of the scientific jargon beforehand. These considerations are what led to a red-orange palette to be chosen for the false colour image of Sagittarius A* - the black hole at the center of the Milky Way. Scientists wanted to convey how hot the glowing material around a black hole is and though blue flames are hotter than orange ones, orange is seen as hotter by wider audiences. Further artistic techniques like this will be needed to make the black hole videos intelligible for non-specialist audiences.

The ngEHT collaboration illustrates the importance of considering varied perspectives and shows how sciences are evolving in the 21st century.

New calculations suggest Mars Odyssey could last until 2025



NASA's Mars Odyssey orbiter has been orbiting Mars since October 2001, making it the longest continually active spacecraft in orbit around a planet other than Earth. Its main mission is to map Mars' surface to help astronomers understand the planet's history.

In January 2022 engineers calculated that Odyssey only had propellant for 12 more months, yet this no longer seems to be the case.

The orbiter initially carried 225 kg of hydrazine propellant which it used along with three spinning reaction wheels to keep its

instruments pointing towards Mars.

"These reaction wheels have to work together to maintain the spacecraft's pointing," Jared Call, Odyssey's mission manager at NASA's Jet Propulsion Laboratory, said in the release. "But with Odyssey completing a full loop every orbit, you need a way to unload the increasing momentum."

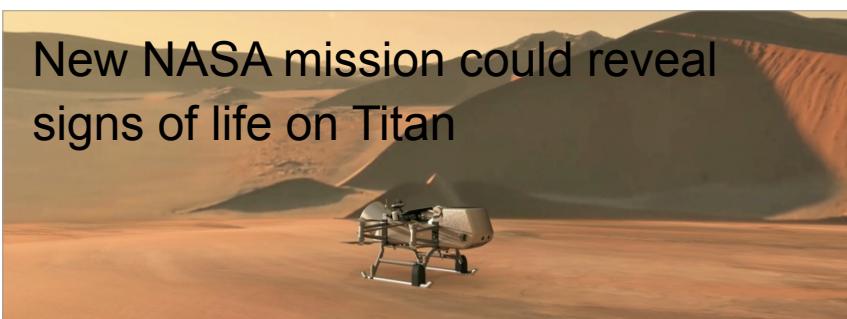
By having the orbiter's thrusters fire out hydrazine propellant in short bursts the momentum of the wheels can be cancelled. Once the propellant runs out, this will no longer be possible.

Since Odyssey has no fuel

gauge, engineers estimated the amount of fuel remaining by applying heat to the propellant tanks. The more hydrazine left in the tanks, the longer it should take them to heat up. In January 2022 this method suggested only 2.8 kg of hydrazine remained.

Puzzled, NASA brought in an outside consultant, Boris Yendler, who suggested that Odyssey's heaters could be skewing calculations. Recent calculations that accounted for this effect suggest that 4 kg of hydrazine remains, enough to last through 2025.

New NASA mission could reveal signs of life on Titan



Dragonfly, NASA's new mission to visit Saturn's largest moon, is set to launch in 2027. It should arrive at the moon, Titan, in 2034 and spend 2.7 Earth years exploring Titan's diverse environments. Dragonfly will carry an instrument called the Dragonfly Mass Spectrometer (DraMS), allowing scientists to study the chemistry of Titan's surface remotely.

"We want to know if the type of chemistry that could be important for early pre-biochemical systems on Earth is taking place on Titan," said Dr. Melissa Trainer of NASA's

Goddard Space Flight Center, Greenbelt, Maryland. Trainer is one of the Dragonfly mission's deputy principal investigators and will lead the DraMS instrument. The instrument will search for evidence of prebiotic chemistry in samples from Titan's surface material at different points of interest. To travel between these points on Titan's surface, the Dragonfly robotic rotorcraft will take advantage of the low gravity and dense nitrogen-based atmosphere (four times denser than Earth's) to

fly like a drone over several kilometers. At each point a drill will be used to extract samples less than a gram in mass and bring them inside the lander's body where the DraMS instrument is housed. The DraMS will analyse the chemical components by first separating them into their base molecules and passing them through sensors for identification, a technique already tested on Mars by an instrument suite aboard the Curiosity rover. "This design has given us an instrument that's very flexible, that can adapt to the different types of surface samples," said Trainer.

Joke of the Week

Why haven't Aliens visited our Solar System yet?
They looked at the reviews and saw it only had one star.