INSTITUTE OF ASTRONOMY
PUBLIC OPEN EVENING

— 27 November 2019 —

A galaxy with three supermassive black holes

The galaxy NGC 6240, as seen by the Hubble Space Telescope, Credit: NASA. Inset: high-resolution image of the galactic centre, showing the three black holes.

There's no getting around it -- the galaxy NGC6240 looks something of a mess. Rather than having the classic elegant spiral arms, NGC6240 is a chaotic whirl of gas, dust, and stars. Such a galaxy can only be formed from a so-called 'major merger', when two galaxies collide to produce a trainwreck of loops and swirls, testaments to their complex gravitational interactions.

Now, astronomers have used the state-of-the-art MUSE Spectrograph on the European Southern Observatory's (ESO) Very Large Telescope (VLT) to peer into the dusty heart of NGC6240, and found something rather surprising -- it doesn't have two supermassive black holes (as might be expected from the remains of a two-galaxy crash) -- but three.

"Up until now, such a concentration of three supermassive black holes had never been discovered in the universe," said Peter Weilbacher of the Leibniz Institute for Astrophysics. "The present case provides evidence of a simultaneous merging process of three galaxies along with their central black holes."

Each of the three SMBHs are giants, with masses of around 90 million times that of our Sun. For comparison, our Milky Way's central black hole has a mass of 'just' 4 million suns.

Triple mergers like this might be the answer to a long-standing problem in astrophysics, that suggests two supermassive black holes might take longer to actually merge than the whole age of the Universe (the 'final parsec problem'). Adding a third SMBH, from a triple merger event, might create the instability needed to get the SMBHs together.

TONIGHT'S SPEAKER

Nina Sartorio

Struggling with the stragglers

Our weekly welcome

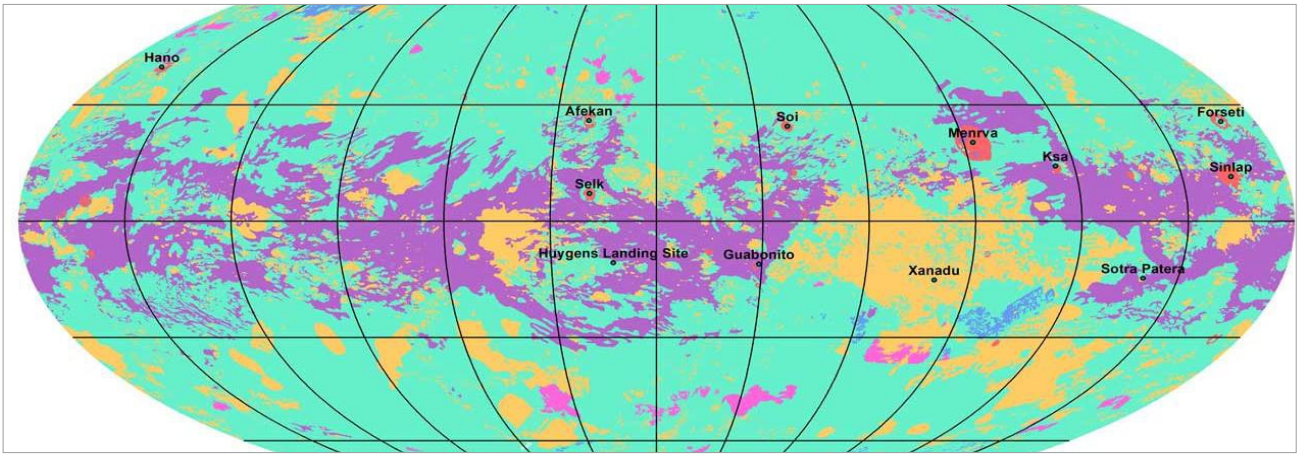
WELCOME to our weekly public open evenings for the 2019/20 season. Each night there will be a half-hour talk which begins promptly at 7.15pm. Please note that the talk will be recorded and archived for online streaming.

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

First global map of Titan revealed



Titan is an important object in our Solar System. The largest of Saturn's moons, it is the only body in our Solar System (other than Earth) that has liquid rivers and lakes on its surface.

Of course, it's not exactly like Earth. Instead of water, Titan is covered in rivers of methane and ethane hydrocarbons (which are only in liquid form due to the -180 degree surface temperature on Titan!). But Titan's surface is amongst the most complex in our Solar System -- and now, with the aid of the Cassini probe, it has been fully mapped for the first time.

The Cassini probe carried out over 100 flybys of Titan before the end of its mission in 2017. Now, a team of space scientists have stitched together the vast quantity of visual and radar imagery into the first complete geological map of Titan.

Titan's equator is dominated by dunes (pink in the map above), and is mostly comprised of plains towards the poles (turquoise). Just 1.5% of the surface is covered in lakes -- though this might change over time, as Saturn moves closer to the Sun around its elliptical orbit.

Most importantly, this new information will be invaluable to NASA's upcoming Dragonfly mission, which aims to land a propellor-powered drone on Titan in the 2030s. It is hoped that Dragonfly will sample Titan's atmosphere, and reveal any potential clues about the building blocks of life.

Most powerful Gamma Ray Burst ever!

Gamma Ray Bursts are highly energetic explosions that are seen in the most distant galaxies. Thought to originate when a massive star goes supernova and collapses to form a compact object, they can release as much energy in a few seconds as the Sun will throughout its 10,000 million year lifespan.

Now, astronomers have spotted the most powerful gamma ray burst ever recorded. It goes by the memorable name GRB 190114C, and released energy over a trillion times more energetic than visible light (over one 'teraelectron-volt', in scientific language). To get to energy levels this high, material in the collapsing star must have been travelling at 99.999% of the speed of light.

Thanks to an automated early-warning system, just 22 seconds after the first sign of the explosion telescopes all over the world were pointing towards the source of the light.

“Hubble’s observations suggest that this particular burst was sitting in a very dense environment, right in the middle of a bright galaxy 5 billion light years away,” said Andrew Levan of the Institute for Mathematics, Astrophysics and Particle Physics at Radboud University in the Netherlands. “This is really unusual, and suggests that this concentrated location might be why it produced this exceptionally powerful light.”

Joke of the Week

Photons who commit crime get sent to prism. (There's a special wing for the ones with ultra-violet tendencies.)