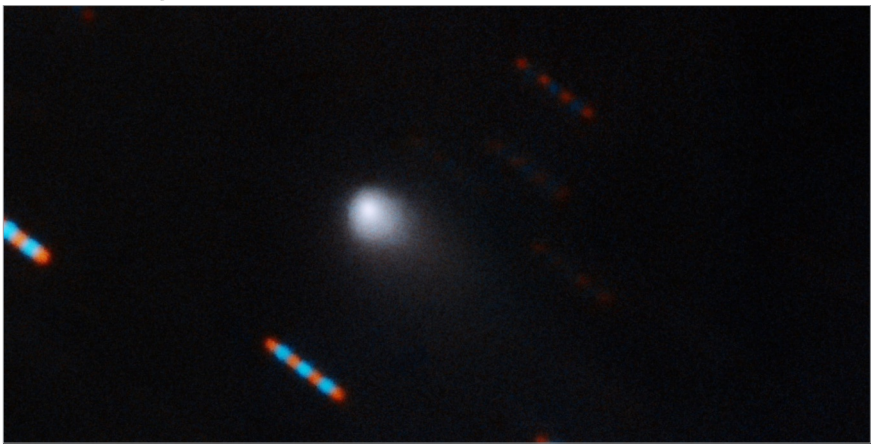
INSTITUTE OF ASTRONOMY
PUBLIC OPEN EVENING

— 16 October 2019 —

Interstellar comet is not so strange after all



The interstellar comet 2I/Borisov, imaged by Gemini. Image credit: Gemini Observatory/NSF/Aura/EPA

It's now official -- the comet 2I/Borisov is an interstellar visitor, which formed around a distant star and may have wandered around our Milky Way for billions of years before passing through our Solar System.

The comet is named for its discoverer, the amateur astronomer Gennady Borisov. Followup observations were soon made, with the intention of mapping the comets orbit around the Sun. Astronomers soon found that the orbit of the comet was not an ellipse (which would imply a closed, stable orbit around our Sun), but a hyperbola -- meaning that comet Borisov is just doing a 'flyby' of our Solar System, arcing in from interstellar space and destined to carry on without being captured by our Sun.

This discovery makes Borisov the first known interstellar comet, and only the second known interstellar traveller (after the rocky meteorite 'Oumuamua, found in 2017).

Being only the second confirmed visitor from outside our Solar System, astronomers were keen to learn the properties of the interstellar traveller. Any unusual features might be a clue that our Solar System differs from other star systems in our Galaxy.

Now the results are in, and it turns out that the comet is exactly the same as comets in our own Solar System.

“The first thing it tells us is that at least some other planetary systems around other stars are similar to ours,” said Piotr Guzik, who led the study.

The comet is travelling at 71,500mph, and is currently between Mars and Jupiter. On 8th December the comet is due to make its closet approach to the Sun, where the extra heat will evaporate frozen material on the comet's surface, and allow astronomers an even better look at this interstellar traveller.

TONIGHT'S SPEAKER

Anastasia Fialkov

Mysterious Fast Radio Bursts

Our weekly welcome

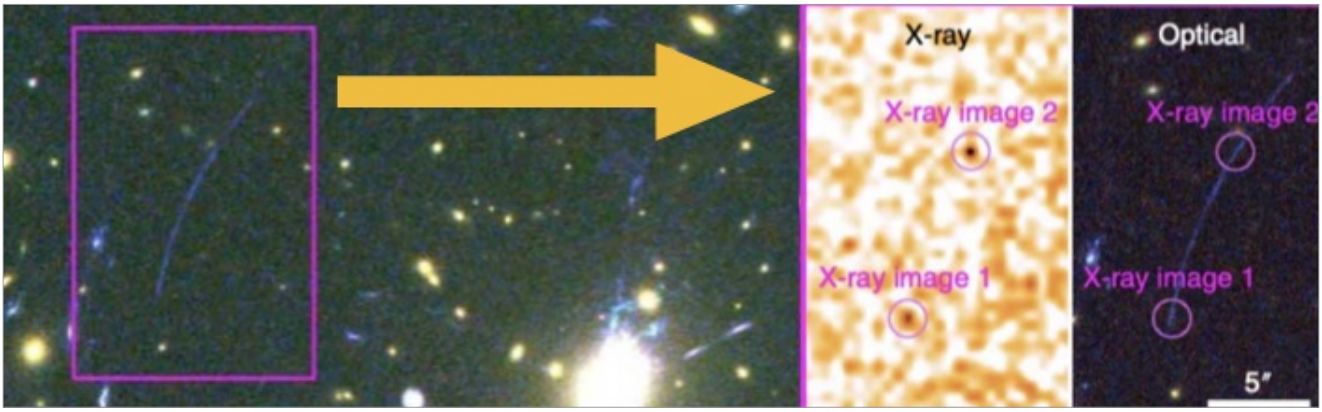
WELCOME to our weekly public open evenings for the 2018/19 season. Each night there will be a half-hour talk which begins promptly at 7.15pm. Please note that the talk will be recorded and archived for online streaming.

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

Gravitationally-lensed galaxy seen in X-rays



Optical (left) and X-ray (right) images of the lensed dwarf galaxy. M. Bayliss/M. McDonald/NASA/ESA

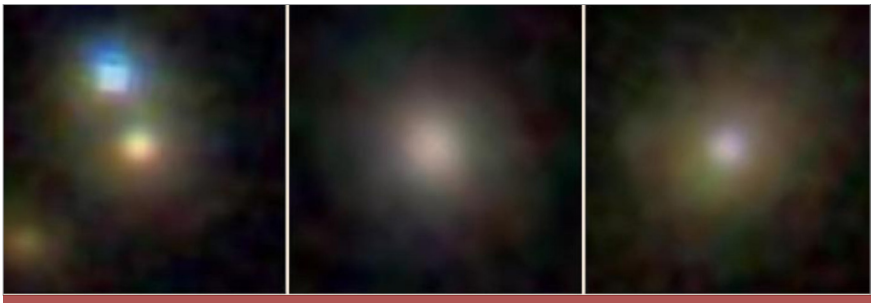
An international team of astronomers have used gravitational lensing to spot X-ray emission from a distant galaxy for the first time ever.

X-rays are highly energetic photons, which are produced by very extreme astrophysical phenomena. In galaxies, X-rays are often produced by special binary stars, in which one of the stars was very massive but has since collapsed down into a neutron star or black hole. The extreme gravity causes matter to siphon off the normal star and onto the compact object -- during which the star-stuff can get so hot it starts emitting in the X-ray.

Because X-rays only come from the most massive stars, astronomers can use information about them to learn all about the extremes of star formation which allow galaxies to grow, The distant galaxy lies behind the massive Phoenix Cluster, which is big enough to warp spacetime around it, acting like a giant 'lens', magnifying light from the (much more distant) galaxy behind.

The team, led by Matthew Bayliss, used NASA's Chandra X-ray Observatory to spot the magnified X-ray signal, which appears to be coming from a tiny dwarf galaxy in formation. Without the magnifying boost of gravitational lensing, the galaxt would have been too small and faint to see. "It's really a new window into studying the properties of the most massive stars that form in the distant universe," Bayliss said.

Black hole winds kill dwarf galaxies



A selection of dwarf galaxies, as seen by SDSS

Astronomers have long known that all massive galaxies have monster black holes lurking in their centres, which can play a dramatic and violent role in shaping the galaxy itself. But astronomers have now found that this isn't just true of massive galaxies. A new study however, suggests that this effect might be even more important in small 'dwarf' galaxies. The researchers identified a sample of 29 dwarf galaxies with black holes in the centres. Of these 29, 6 showed clear signs of strong winds blowing out from their central black holes. If all the wind gets expelled, that can have the effect of cutting off star formation in these small galaxies. "In these six cases, the wind has a negative impact on star formation," said Dr. Laura Sales, who co-authored the study.

This new study supports theoretical work carried out earlier this year at the IoA, led by PhD student Sophie Koudmani. Koudmani and collaborators found that dwarf galaxies, when simulated with powerful computers, showed evidence for strong black-hole outflows.

As Dr. Sales, put it, "Theoretical models for the formation and evolution of galaxies have not included the impact of black holes in dwarf galaxies. We are seeing evidence, however, of a suppression of star formation in these galaxies."

Joke of the Week

I'm reading a book about anti-gravity -- it's impossible to put down!