Institute of Astronomy
PUBLIC OPEN EVENING
— 17 October 2018 —

What is 'Oumuamua?


Artist's impression of 'Oumuamua.
Credit: M. Kornmesser/ESO

'Oumuamua, the interstellar traveller which hit the headlines a year ago as it passed through the inner Solar System, continues to perplex astronomers. It was first spotted almost exactly one year ago (on 19 October 2017), at which point it had already swung past the Sun and was heading out of our Solar System towards the stars. An analysis of 'Oumuamua's orbit revealed that it had to have originated from outside of our Solar System, making it the first interstellar object ever observed. It is now racing away at a blistering 100,000 km/h – and has left a lot of confusion in its wake.

One unsolved mystery is rather a big one: what exactly is 'Oumuamua? Initially classified as a comet, further observations with the Very Large Telescope failed to see a 'coma', the fuzzy envelope of evaporating gas which surrounds comets (and gives them their name). So it was decided: 'Oumuamua had to be an asteroid – a barren rock, similar to those orbiting the Sun between Mars and Jupiter.

This past Summer, new evidence came to light which suggested that 'Oumuamua might be a comet after all. Careful mapping of its movements revealed that it wasn't moving as expected – suggesting that there was more than just gravity acting on 'Oumuamua. In fact, the movements look a lot like those caused when comets 'outgas', a process in which gas spurts out from a comet and pushes the comet along – a bit like a rocket engine. So, can we settle the matter and say that 'Oumuamua is a comet?

Well, no. First of all, comets have tails. And try as we might, no trace of a tail was ever found on 'Oumuamua. And a new study by University of Cambridge astronomer Roman Rafikov seems to put the comet hypothesis to bed once and for all. Comets are fragile objects (being made of snow and ice, rather than rock like asteroids), and Rafikov argues that whatever force moved 'Oumuamua non-gravitationally would have been enough to smash a comet to bits.

So is 'Oumuamua a comet or an asteroid? It's hard to tell. "There's very strong and unequivocal evidence on both sides," said Roman Rafikov. One answer, of course, might be that the difference between 'comets' and 'asteroids' might not be as stark as we think. Whatever 'Oumuamua is though, it's certainly not alone. It is thought that several thousand interstellar objects pass through our Solar System every year ('Oumuamua was just the first one we found!). With the next generation of telescopes coming online in the 2020s, astronomers hope to find and study plenty of interstellar visitors.

TONIGHT'S SPEAKER

Catrina Diener
Galactic mega-cities: A short story on galaxy clusters

Our weekly welcome

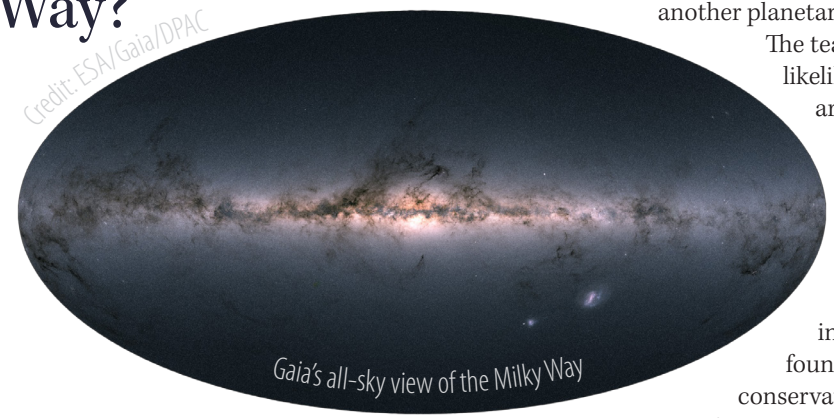
WELCOME to our weekly public open evenings for the 2018/19 season. Each night there will be a half-hour talk which begins promptly at 7.15pm. Please note that the talk will be recorded and archived for online streaming.

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/public_observing/current

Could life spread through the Milky Way?



THE origin of life on Earth is one of the Universe's great puzzles. And one possible answer is rather exciting: life on Earth might have originated somewhere in space.

The idea is known as 'Panspermia', and theorises that objects travelling through the Universe (including comets, asteroids, and interstellar travellers like 'Oumuamua) could carry microorganisms could 'seed' life wherever they land. As Stephen Hawking put it in 2009, "Life could spread from planet to planet or from stellar system to stellar system, carried on meteors."

Most Panspermia theories are limited to short-range travel – the idea that Earth may have been seeded by early Martian life, for example.

However a new paper by Idan Ginsburg at Harvard University, titled "Galactic Panspermia", asks whether Panspermia could be possible on a galaxy-wide scale.

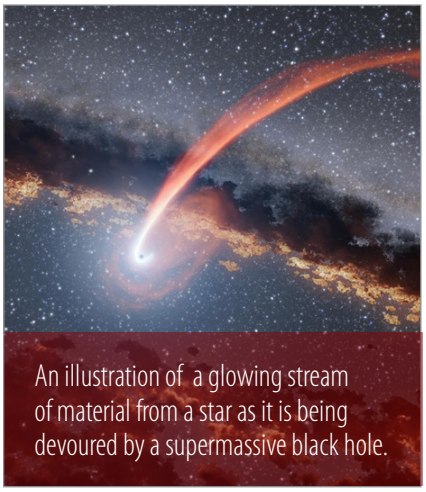
The paper was inspired by the discovery of the interstellar object 'Oumuamua. Co-author Abraham Loeb said "Interstellar objects like `Oumuamua could be captured through their gravitational interaction with Jupiter and the Sun. The Solar System acts as a gravitational 'fishing net'. These bound interstellar objects could potentially plant life from another planetary system".

The team calculated the likelihood that objects are travelling between star systems around the galaxy, in the same way as 'Oumuamua. They varied the sizes and speeds of the interstellar bodies, and found that even the most conservative estimates suggest that interstellar travellers should be very, very common – suggesting that the Milky Way is more than capable of transferring potentially life-bearing objects across vast distances. Loeb goes even further: "In principle, life could even be transferred between galaxies, since some stars escape from the Milky Way", he said.

While this remains speculative, it may be that the building blocks for life on Earth could have come from another star system – or even another galaxy entirely.

Black hole gobbles material at record-breaking speed

Credit: NASA/JPL-Caltech


An illustration of a glowing stream of material from a star as it is being devoured by a supermassive black hole.

BLACK HOLES are pretty extreme objects. Their intensely strong gravitational pulls can accelerate material to phenomenal speeds before being swallowed up by the central singularity. A new paper led by Ken Pounds at the University of Leicester reports an Earth-sized clump of matter falling into a supermassive black hole at a truly record-breaking speed: 100,000 kilometres per second, or 1/3 of the speed of light.

The black hole in question lives over a billion light years away at the centre of the galaxy PG1211+143. The team spotted X-ray emission from the doomed clump, tracking it as it fell into the massive black hole.

Intriguingly, the in-falling material didn't seem to be rotating around the black hole as it fell in. Most matter that is gobbled up by black holes forms a swirling 'accretion disk' as it approaches the edge, like water circling a plug hole. But this new clump seemed to fall straight in, without swirling around beforehand.

This was unexpected! If this so-called 'direct accretion' is common, it might provide a clue as to how black holes in the early Universe can grow so fast.

"First Man" at the Arts Picturehouse

An event for astronomy fans: on Monday 22 October 2018 (18:00-21:00), the film "First Man" will play at the Arts Picturehouse in Cambridge, preceded by a talk by IoA astronomer Carolin Crawford. "First Man" is a look at the life of the astronaut, Neil Armstrong, and the legendary space mission that led him to become the first man to walk on the Moon on July 20, 1969. Before the film Carolin Crawford will talk about "The Future of Lunar Exploration".

Tickets are available from the Arts Picturehouse website.

Joke of the Week

I'm reading a book about anti-gravity, and I just can't put it down!