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News

Features

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Oumuamua Ripped From  
Earth-sized Planet

<https://www.dailymail.co.uk/sciencetech/article-8213683/interstellar-visitor-Oumuamua-ripped-fragment-destroyed-planet.html/>

## Solar system's first interstellar visitor Oumuamua was ripped from the surface of an Earth-sized planet that 'got too close to its host star', scientists claim

Daily Mail 13<sup>th</sup> April 2020 >

- Oumuamua was first spotted hurtling through the solar system in October 2017
- Astronomers have speculated on its origins and make-up since its discovery
- Chinese and American researchers believe it was ripped away from a planet
- Experts expect to discover many more interstellar objects in the coming years
- It was either part of a tiny protoplanet that orbits very near to a larger star or a super-Earth sized planet that got too close to a lower mass white dwarf star

The strange cigar-shaped Oumuamua space rock discovered in 2017 was ripped from a planet and sent hurtling into space after it came too close to its star.

When it appeared it became the first visitor from another star system to be spotted from Earth, and astronomers have speculated on its origins ever since.

Experts from National Astronomical Observatories of the Chinese Academy of Sciences believe it could have been ripped from a planet getting close to its star.

The team speculate that it could have been part of a super-Earth sized exoplanet orbiting very close to its star, that was then destroyed by tidal forces.

Astronomers say Oumuamua is 'the tip of the iceberg' for alien visitors and expect to discover many more rocks from other star systems in the next few years.

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Study lead author Dr Yun Zhang thinks the process they describe could mean that Oumuamua is just one of an army of interstellar projectiles hurtling through space.

Oumuamua was discovered on October 19, 2017 by the University of Hawaii's Pan-STARRS1 telescope that was looking for comets and asteroids near the Earth.

It was hurtling through space at a staggering 196,000 miles per hour (313,822 km/h) and the name is Hawaiian for 'a messenger from afar arriving first'.

'The discovery of Oumuamua implies that the population of rocky interstellar objects is much larger than we previously thought,' said Zhang.

'On average, each planetary system should eject in total about a hundred trillion objects like Oumuamua.'

When astronomers first spotted Oumuamua 2017, little was known about where the perplexing rock came from and how it was formed.

This study, published in the Nature Astronomy journal, has now offered the first set of answers to those questions.

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'Oumuamua is absolutely nothing like anything else in our solar system,' Zhang said.

'Its dry surface, unusually elongated shape, and puzzling motion even drove some scientists to wonder if it was an alien probe

'It is really a mysterious object, but some signs, like its colours and the absence of radio emission, point to 'Oumuamua being a natural object.

'Our objective is to come up with a comprehensive scenario, based on well understood physical principles, to piece together all the tantalising clues.'

The researchers suggest that as the rock tumbled past its star, it began to spin and evaporate off most of its more volatile substances.

Additionally, they suggest the 'cigar' may have originated as a tiny 0.6 mile (1km) wide planet precursor, or a close-in rocky super-Earth, orbiting a white dwarf.

Oumuamua's rocky body was a surprise to astronomers who assumed the first interstellar visitor would be icy like a comet with a visible tail but the visitor's appearance is dry and similar to rocky bodies like an asteroid.

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The researchers ran high-resolution computer simulations to model what happens when a relatively small object flies close to a massive star.

They observed that the tidal forces of the larger body were capable of tearing the smaller one apart, as happened to the Shoemaker-Levy 9 comet when it came close to Jupiter, the researchers explained.

These tidal processes can eject some debris into interstellar space, which researchers suspect happened to Oumuamua and also explain its shape.

'The elongated shape is more compelling when we considered the variation of material strength during the stellar encounter,' Zhang said.

'The ratio of long axis to short axis can be even larger than ten to one.'

The team suggests their theory could also explain why Oumuamua moves in an unusual, non-gravitational way.

Dr Zhang said: 'If Oumuamua was produced and ejected in the way we suggest, plenty of residual water ice could be activated during its passage through the solar system.'

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'The resulting outgassing would cause accelerations that match Oumuamua's comet-like trajectory.'

The researchers also used thermal modelling to show that the cigar-like rock would have melted as it passed close to the star and reformed into a solid elongated shape as it travelled away.

Since Oumuamua-type objects may pass through habitable zones, the researchers are not ruling out the possibility that they could transport matter - called panspermia - capable of generating life.

Dr Zhang said: 'This is a very new field. These interstellar objects could provide critical clues about how planetary systems form and evolve.'

Study co-author Dr Douglas Lin, of the University of California said that Oumuamua is just the 'tip of the iceberg.'

Lin expects there will be many more similar objects found by the Vera C. Rubin Observatory currently under construction in Chile.

The Rubin is a wide-field reflecting telescope that can photograph the entire available sky every few nights - making it perfect for spotting 'alien visitors'.

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Dr Matthew Knight, of the Oumuamua International Space Science Institute team said this study, which he was not involved in, does a 'remarkable' job of explaining the Oumuamua's unusual properties with a 'single, coherent model.'

The United States Naval Academy astronomer added: 'As future interstellar objects are discovered in coming years, it will be very interesting to see if any exhibit Oumuamua-like properties.'

'If so, it may indicate that the processes described in this study are widespread.'

In only another four years, it will pass Neptune's orbit on its way back into interstellar space.

Because 'Oumuamua is the first interstellar object ever observed in our solar system, researchers caution that it's difficult to draw general conclusions about this newly-discovered class of celestial bodies.

However, observations point to the possibility that other star systems regularly eject small comet-like objects and there should be more of them drifting among the stars.

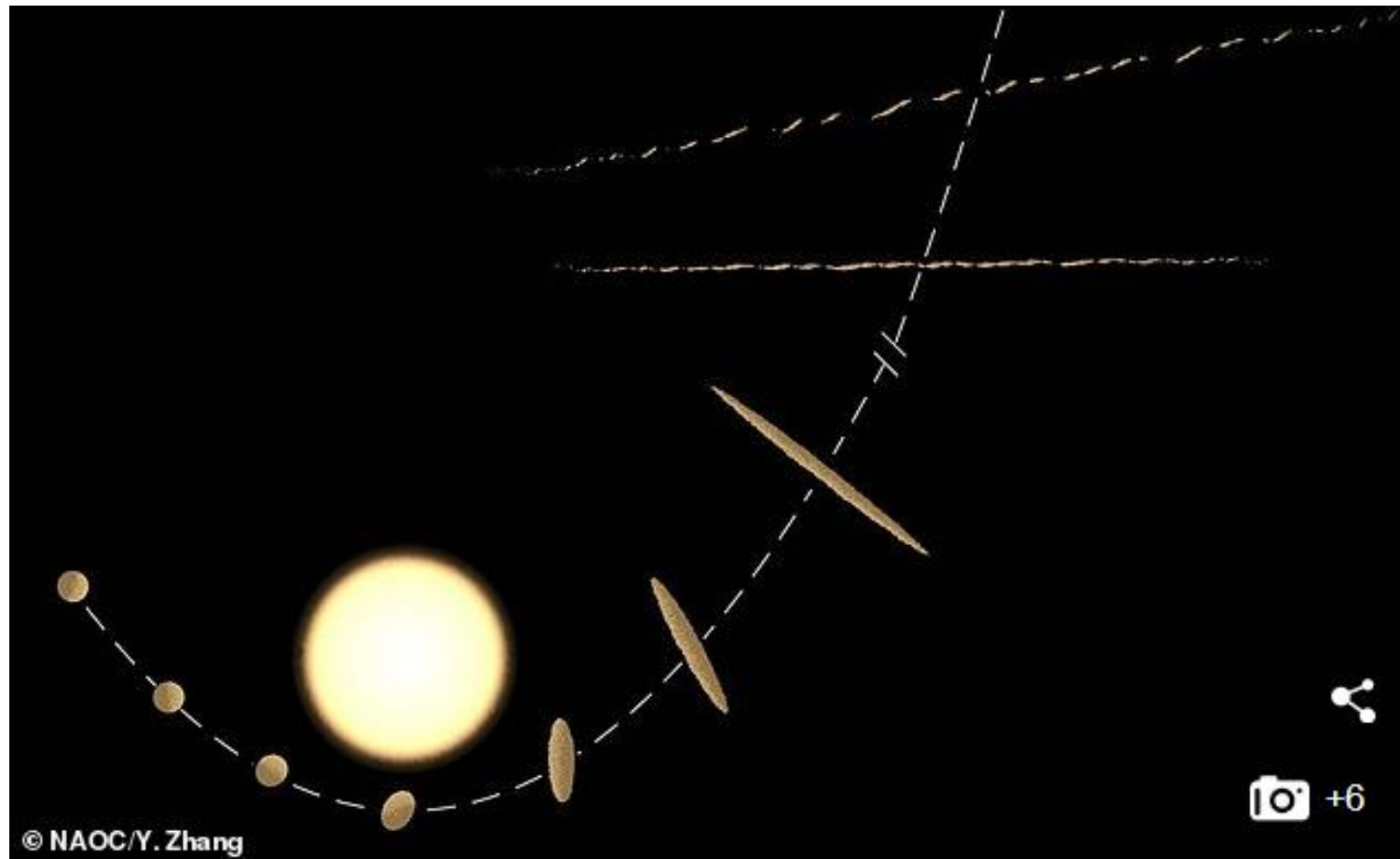
Future ground- and space-based surveys could detect more of these interstellar vagabonds, providing a larger sample for scientists to analyse.

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This illustration shows the tidal disruption process that can give rise to 'Oumuamua-like objects. As a planet approaches close to its host star, forces stretch and rip it apart, sending fragments hurtling out into space





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### HOW DID OUMUAMUA FORM AND LAUNCH INTO SPACE?

Researchers from China believe that Oumuamua was part of a larger body orbiting close to a star. They created a computer simulation based on the suspected size and trajectory of the alien asteroid.

The simulation worked backwards to calculate what it would take to produce an object with the shape of Oumuamua and a similar trajectory.

The authors say it had to have broken off from a larger body that was close to its host star. It was either:

- part of a 0.6 mile (1km) wide protoplanet orbiting a mid-sized star
- part of a super-Earth sized planet orbiting a low-mass White Dwarf
- The planet got too close to its star and as it approached, the tidal forces from the stars gravity caused it to stretch.

Eventually as the rock orbited the star closer and closer it was split apart and pushed away into smaller fragments.

The force of gravity from the star sent these fragments hurtling into deep space with one eventually arriving in the solar system in 2017.

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### WHAT IS 'OUMUAMUA AND WHAT DO WE KNOW ABOUT IT?

A cigar-shaped asteroid named 'Oumuamua sailed past Earth at 97,200mph (156,428km/h) in Oct.

It was first spotted by a telescope in Hawaii on 19 October, and was observed 34 separate times in the following week.

It is named after the Hawaiian term for 'scout' or 'messenger' and passed the Earth at about 85 times the distance to the moon.

It was the first interstellar object seen in the solar system, and it baffled astronomers.

Initially, it was thought the object could be a comet.

However, it displays none of the classic behaviour expected of comets, such as a dusty, water-ice particle tail.

The asteroid is up to one-quarter mile (400 meters) long and highly-elongated - perhaps 10 times as long as it is wide.

This aspect ratio is greater than that of any asteroid or asteroid observed in our solar system to date.

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But the asteroid's slightly red hue — specifically pale pink — and varying brightness are remarkably similar to objects in our own solar system.

Around the size of the Gherkin skyscraper in London, some astronomers were convinced it was piloted by aliens due to the vast distance the object traveled without being destroyed – and the closeness of its journey past the Earth.

Alien hunters at SETI – the Search for Extra-terrestrial Intelligence based at Berkeley University, California said there was a possibility the rock was ‘an alien artefact’.

But scientists from Queen’s University Belfast took a good look at the object and said it appears to be an asteroid, or ‘planetesimal’ as originally thought.

Researchers believe the cigar-shaped asteroid had a 'violent past', after looking at the light bouncing off its surface.

They aren't exactly sure when the violent collision took place, but they believe the lonely asteroid's tumbling will continue for at least a billion years.