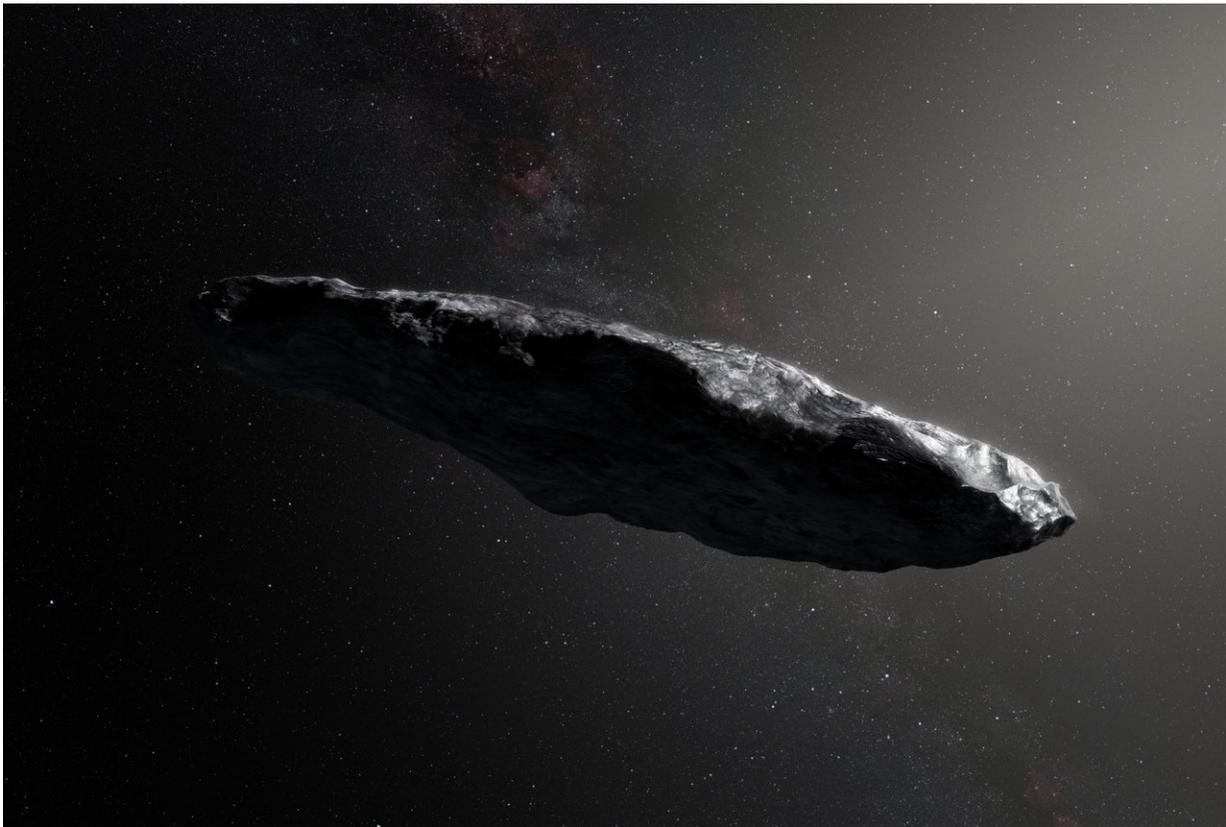


# 'Oumuamua had a violent past and has been tumbling around for billions of years

February 12 2018

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Credit: ESO/M. Kornmesser

The first discovered interstellar visitor to our solar system has had a violent past, which is causing it to tumble around chaotically, a Queen's University Belfast scientist has discovered.

'Oumuamua flew through our solar system in October and was originally thought to be a comet, then it was later revealed as a cucumber-shaped asteroid.

Since October, Dr. Wes Fraser, alongside Dr. Pedro Lacerda, Dr. Michele Bannister, and Professor Alan Fitzsimmons, all from Queen's University Belfast's School of Mathematics and Physics, have been analysing the brightness measurements of the object. They have been working with an international team, including Dr. Petr Pravec from the Academy of Sciences of the Czech Republic, Dr. Colin Snodgrass from The Open University and Igor Smolić from the University of Belgrade.

Straight away, they discovered that 'Oumuamua wasn't spinning periodically like most of the small asteroids and bodies that we see in our solar system. Instead, it is tumbling, or spinning chaotically, and could have been for many billions of years.

While it is difficult to pinpoint the exact reason for this, it is thought that 'Oumuamua impacted with another asteroid before it was fiercely thrown out of its system and into interstellar space.

Dr. Fraser explains: "Our modeling of this body suggests the tumbling will last for many billions of years to hundreds of billions of years before internal stresses cause it to rotate normally again.

"While we don't know the cause of the tumbling, we predict that it was most likely sent tumbling by an impact with another planetesimal in its system, before it was ejected into [interstellar space](#)."

Until now, scientists had been puzzled that 'Oumuamua's colour varied between measurements. However, Dr. Fraser's research has now revealed that its surface is spotty and that when the long face of the cucumber-shaped object was facing telescopes on Earth it was largely

red but the rest of the body was neutral coloured, like dirty snow.

Dr. Fraser explains: "Most of the surface reflects neutrally but one of its long faces has a large red region. This argues for broad compositional variations, which is unusual for such a small body."

The research findings, which have been published in *Nature Astronomy*, have helped to build a more accurate profile of 'Oumuamua.

"We now know that beyond its unusual elongated shape, this space cucumber had origins around another star, has had a violent past, and tumbles chaotically because of it. Our results are really helping to paint a more complete picture of this strange interstellar interloper. It is quite unusual compared to most asteroids and comets we see in our own solar system," comments Dr. Fraser.

Since 'Oumuamua was spotted in October, a team of researchers at Queen's University Belfast have been analysing the object in detail. This is the third paper to be published by their team, which includes Ph.D. students Meabh Hyland and Thomas Seccull. Dr. Wes Fraser, Dr. Michele Bannister, Dr. Pedro Lacerda and Professor Alan Fitzsimmons have been supported by funding from the Science and Technology Facilities Council for their research.

**More information:** Wesley C. Fraser et al. The tumbling rotational state of 1I/'Oumuamua, *Nature Astronomy* (2018). [DOI: 10.1038/s41550-018-0398-z](https://doi.org/10.1038/s41550-018-0398-z)

Provided by Queen's University Belfast

Citation: 'Oumuamua had a violent past and has been tumbling around for billions of years

(2018, February 12) retrieved 22 September 2024 from  
<https://phys.org/news/2018-02-oumuamua-violent-billions-years.html>

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