Oumuamua—what is it?

Wayne Spencer

Since 19 October 2017 there has been much interest in an unusual object known as Oumuamua (pronounced 'Oh mua – mua', Hawaiian for a "messenger from afar who came first"). It is now considered to be the first known case of an interstellar object that has passed through our solar system. Some have asked whether an object like this poses a problem from a young-age creation perspective. Oumuamua was discovered by the Pan-STARRS telescope at the University of Hawaii. The Pan-STARRS telescope searches for faint objects such as comets, asteroids, near-earth objects, and transneptune objects.

The Oumuamua object was found to be travelling toward our sun at a very high speed. It was following a hyperbolic trajectory, which means its orbit about our sun was not closed, but open. It flew by our sun and left our solar system in another direction, making a sharp turn as it passed by the sun. Such an object will pass us by once and will likely never be seen again. There has been debate among scientists regarding what this object is and about its origin. Oumuamua's official designation was changed twice after its discovery. It was first treated as a comet and named C/2017 U1.[1] Its orbit is somewhat similar to the Halley Type comets because its trajectory toward the sun was a highly inclined path and it left on another highly inclined path. Soon after it was given this designation, scientists found that it did not give off any dust or water, unlike comets. So, it was then named A/2017 U1 like an asteroid.[1,2] It has been estimated that out in space, before it came near the sun, it was travelling at approximately 26.4 km/s (kilometres per second).[3] Its approximate top speed as it passed near our sun was 87.3 km/s.[3] Then as it travelled away from the sun its speed was approximately 38.3 km/s.[3] Eventually, as new information came in on the object, it was given a new kind of designation. Thus its official designation is now 1I/2017 U1, which classifies it as an interstellar object. This makes it the first object in this new classification.

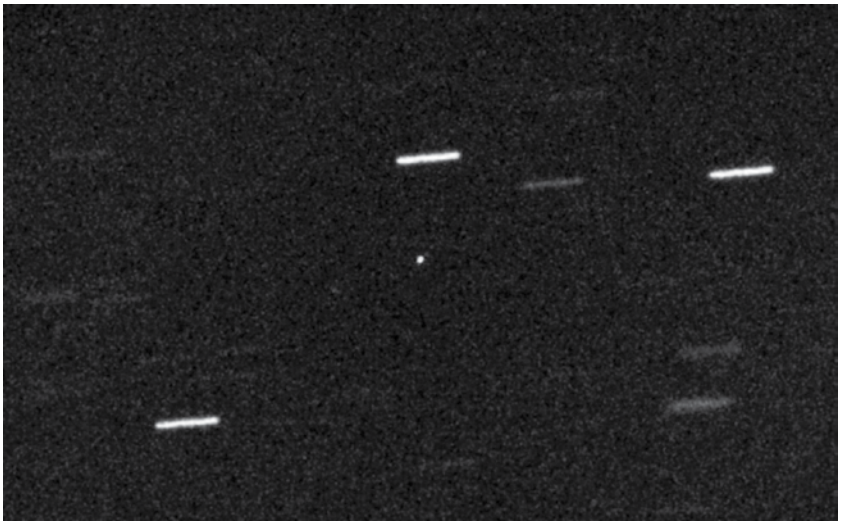

Figure 1. The round dot in the centre of the image is Oumuamua. The image was captured by the William Herschel telescope in the Canary Islands on 28 October 2017. The background stars appear streaked because the telescope is tracking on Oumuamua, which is moving at high speed.

Oumuamua has another peculiar characteristic. It seems to be a very long narrow object, often described as cigar-like. An object like this is only a very faint point of light and the outline of the object cannot actually be seen. However the variation in brightness as it tumbles in space generally gives a hint of its proportions. The brightness of Oumuamua varies by a factor of 10 over a period of just under four hours. The European Southern Observatory (ESO) estimated its rotation period at 7.34 ± 0.06 hours.[4] The Gemini South telescope in Chile was used to obtain spectroscopic data on Oumuamua. The object's colour and spectrum is most similar to carbonaceous asteroids, such as the C-Type or D-Type asteroid classes.[4] Estimating the size is uncertain for a faint object such as this. A NASA article estimates its length at up to 400 m, and its width 40 m.[3] Some other sources estimate it as smaller, such as the National Optical Astronomy Observatory in Tucson, Arizona, which estimated it to be 180 m in length.[5] These should only be taken as very rough estimates. Its shape is however a significant puzzle for naturalistic formation models. Accepted naturalistic planetary and solar system models always involve small bodies forming by colliding and sticking together. But a long narrow object would be vulnerable to being broken apart if it were in an environment with many other rocky objects near it colliding with each other. Some researchers have proposed such an object could form from an exoplanetary system in which a planet came too near a star and was torn apart by tidal forces.[6,7] Dense stars or binary star systems might accelerate rocky fragments into interstellar space.

Where does it come from?

Oumuamua's trajectory followed a hyperbola, rather than an ellipse. This has prompted speculation as to its origin. Its speed is indeed consistent with an object coming from outside our solar system. If an object from within our solar system were propelled away from the sun by a planet flyby, for example, it could still be on an elliptical orbit, meaning it would return again. But if it were propelled outward at high enough velocity, it would escape the sun's gravity and continue on in interstellar space on a hyperbolic trajectory. An object on a hyperbolic trajectory leaving our solar system cannot return. Asteroids and comets can sometimes be propelled away from the sun by Jupiter or Saturn. Since Oumuamua followed a hyperbolic path moving toward our sun, there is a good possibility it came from between the stars in our galaxy. Scientists tend to assume that it had to come from a star and form by some naturalistic process. But this assumes a history for the object that cannot actually be known. If it did form by naturalistic models and travel across space it could require millions of years to cross space. This is based on considerations of the direction that Oumuamua was coming from as it approached the sun.[1]

Scientists have proposed that other stars could have their own 'Oort clouds' of comet reservoirs just as ours is alleged to have. These 'Oort clouds' occasionally would lose comets to interstellar space. Also, many small bodies could be 'lost' into interstellar space in the early stages of the formation of any planetary system, by today's accepted models. Forming planets, especially large ones similar to Jupiter, can propel small bodies away at high speed if they pass by it near the planet. If this were happening around many nearby stars, there should actually be many interstellar comets (or rocky objects) crossing space. Astronomers have searched for interstellar comets for years and have considered it puzzling that they have not been seen with some regularity.[8,9] In 1993, two scientists estimated that for every comet "trapped in the Oort cloud, there should be 30–100 comets lost into the interstellar medium".[10] Note that this quote is only considering our own solar system. This comes from theories on how the Oort cloud would form and how the Oort cloud would randomly lose objects into interstellar space over time. The same issue could exist for other star systems regarding rocky objects that would be deflected outward into interstellar space. However the estimates of rocky objects in interstellar space would be lower. All of this is how today's scientists view how there could be objects between the stars of our galaxy.

But now there is one possible example of an observed interstellar object. This may be taken by some as confirming modern theories. However modern theories have a problem with explaining why, if the galaxy and our solar system are billions of years old, is there is only one such object? Oumuamua is not like comets in its composition and it is not like asteroids in its shape and proportions. It will be interesting to see if more rocky or comet-like objects like Oumuamua are seen in coming years. Some scientists have assumed that interstellar objects have always been passing through our solar system but we just haven't had instruments sensitive enough to see them. But even without the best modern sensitive detectors, some interstellar objects would likely be visible as they pass near the sun, as Oumuamua has.

A creation perspective

A possible creationist approach to explaining such an object is to suppose it was simply supernaturally created out in interstellar space when the galaxy was created. This would be on Day 4 of Creation Week. We don't know what objects may be out in interstellar space between the stars. If Oumuamua were created in

interstellar space, this would mean it did not have to form from collisions and it did not have to cross the entire distance between another star and our sun. It could have been moving roughly in sync with the galactic spiral arms until it wandered near our system. There may be evidence of this published in a relatively new scientific publication. The American Astronomical Society started a new publication called *Research Notes of the American Astronomical Society*. This is a non-peer-reviewed publication with short reports from researchers. In 2017 a report by Mamajek in this publication elaborated on the motion of Oumuamua in relation to the galaxy. Oumuamua's velocity was estimated prior to coming near our sun and compared to the overall motion of the galaxy and that of the Local Standard of Rest (LSR) of nearby stars. Mamajek states the following (NB his letters U, V, and W refer to galactic polar coordinates):

> "When the velocity is compared to the local stars, 'Oumuamua can be ruled out as co-moving with any of the dozen nearest systems, i.e. it does not appear to be associated with any local exo-Oort clouds (most notably that of the Alpha Centauri triple system) … 'Oumuamua is remarkable for showing both negligible radial (U) and vertical (W) motion, while having a slightly sub-Keplerian circular velocity (V; by ~11 km/s). These calculations strengthen the interpretation that A/2017 U1 has a distant extrasolar origin, but not among the very nearest stars. Any formation mechanism for this interstellar asteroid should account for the coincidence of 'Oumuamua's velocity being so close to the LSR."[11]

Scientists have also suggested Oumuamua is a 'young object' (in their old-age timescale) because certain star regions suggested to be where it might have come from are at distances requiring only about 150 Ma or less for the object to reach us.[1] This is based on estimates considering the general direction it came from. Though it is possible to project backward along its orbit, this is not precise enough to confidently identify which star it may have come from. The stars within the galaxy move in the time it would take Oumuamua to cross space. The quote above also implies that Oumuamua is not of the expected velocity range to have originated from one of the nearby stars. Instead it was essentially moving with the flow of the galaxy until it came near our system. So if the galaxy and the solar system are billions of years old, why is it that there is only one observed example of an interstellar object? Considering our solar system and our galaxy to both be young may help explain Oumuamua. However we should wait and see what else may be discovered about interstellar objects.

Naturalistic old-age assumptions are not so reasonable as many are led to believe. We must learn to balance the truth of Scripture with the scientific considerations regarding new discoveries. We can always look forward to the surprising and interesting things God has created for us to discover next.

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