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## AN INTERSTELLAR VISITOR

Ken Tapping, 13<sup>th</sup> February, 2018

On 19 October, 2017, Robert Weryk was analyzing data from the Pan-STARRS 1 telescope at Haleakala Observatory in Hawaii, when he spotted something odd. It was an object moving through our Solar System so fast it had to have come from interstellar space, and so fast the Sun's gravity would never capture it. It would go flying off again into interstellar space, never to return. The Canada France Hawaii Telescope joined in to find out more about this mysterious object. By 5 November, it was clear we were definitely looking at a transient visitor to our cosmic neighbourhood. The object was about 200 – 400 m long and about ten times as long as it was wide. This is a very unusual shape for an asteroid or cometary body.

This story might sound rather familiar. In 1973 science fiction author and visionary Arthur C. Clarke wrote a book "Rendezvous with Rama", in which telescopes detected an object that had to be coming from interstellar space. A space probe was shot past it for a close look. The images it sent back revealed the visitor to be a spacecraft. It passed close to the Sun, refuelling from the solar corona, and just kept on going, heading out into space again. Even though we did not believe our real-life interstellar visitor to be an alien spaceship, it still attracted huge interest. There was a popular opinion that the object should be named Rama. However, it finally ended up with the name Oumuamua, which is a Hawaiian word meaning "scout" or "visitor". Unfortunately, despite its long, thin shape, it looked as though Oumuamua was not an alien spaceship. However, any visitor from "out there" is always of great interest.

Oumuamua was too small for our telescopes to image. However, there are other ways to obtain information. By monitoring changes in its brightness we found out it was spinning more or less end over end, with each rotation taking between 7 and 8 hours. The object had a reddish colour, which could be due to metal-rich minerals

having been exposed to cosmic radiation for an extremely long time, perhaps billions of years. There were also traces of organic molecules. In this case "organic" is used in the chemical sense, meaning carbon-based molecules, not necessarily associated with any form of living creatures. Any attempt to put Oumuamua's story together requires adding a lot of imagination to the few facts we have, but here goes with my attempt.

Many light years away and billions of years ago two objects in a young planetary system collided. Some of the fragments, including our recent visitor, were thrown out of the system altogether. Volcanic rocks, like basalt, which is common on the Earth, Moon and elsewhere, contain minerals rich in iron and magnesium, such as olivine. Basalt is normally black or dark grey in colour. However, when exposed to the weather, these minerals break down, releasing iron oxide, which is red. In space the weathering process is different and much slower. However, over billions of years, high-energy cosmic ray particles will break down mineral molecules leading to a similar result.

Oumuamua is now heading back out into interstellar space. With the huge distances between the stars, being thrown off in a random direction is unlikely to get you to another star. However, if throwing objects off into interstellar space is a common thing in the formation of new planetary systems, there could be a lot of those objects out there. If we are lucky enough to get another, it would be great if we could get a really close look. Don't expect to see anyone waving.

Before dawn, Jupiter lies low in the south. Mars is to its left, just above the red star Antares, which means rival of Ares. Mars is the Roman god of war; Ares is his Greek name. Saturn lies low in the southeast. The Moon will be New on 14 February.

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