Wrong-way asteroid plays 'chicken' with Jupiter

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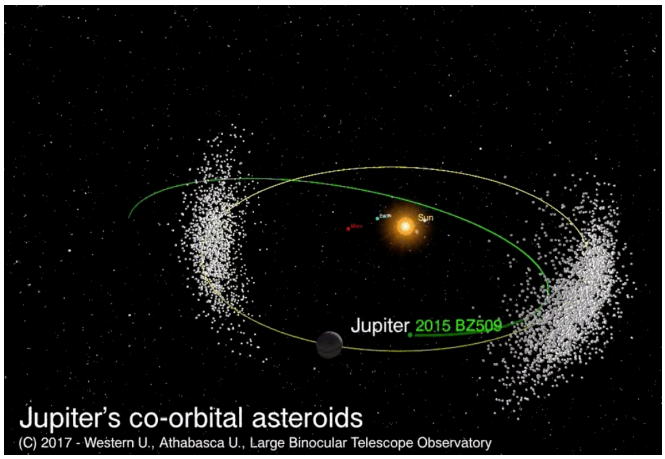

Asteroid Bee-Zed avoids colliding with Jupiter and with the Trojan asteroids with every wrong-way pass it makes. Credit: Western University (Canada), Athabaskan University, Large Binocular Telescope Observatory

For at least a million years, an asteroid orbiting the "wrong" way around the sun has been playing a cosmic game of chicken with giant Jupiter and with about 6,000 other asteroids sharing the giant planet's space, says a report published in the latest issue of *Nature*.

The asteroid, nicknamed Bee-Zed, is the only one in this solar system that's known both to have an opposite, retrograde orbit around the sun while at the same time sharing a planet's orbital space, says researcher and co-author Paul Wiegert of Western's Department of Physics and Astronomy.

All but 82 of the million or so known asteroids in our solar system travel around the sun in what's called a prograde motion: that is, counter-clockwise when visualized from above. But asteroid 2015 BZ509 ("Bee-Zed" for short) circles clockwise, in a retrograde motion—moving against the flow of all other asteroids in the giant planet's orbital entourage.

Put another way, it's as if Jupiter is a monster truck on a track circling the sun, and the asteroids in Jupiter's orbit are sub-compact cars all whizzing along in the same direction. Bee-Zed is the rogue—driving around the track in the wrong direction—steering between the 6,000 other cars and swerving around the monster truck. And it does so every single lap, and has done so for thousands of laps for a million years or more.

So how does it avoid colliding with Jupiter? Jupiter's gravity actually deflects the asteroid's path at each pass so as to allow both to continue safely on their way, Wiegert says.

Little is known about the asteroid, which was discovered in January, 2015. It has a diameter of about three kilometers and it may have originated from the same place as Halley's comet, which also has a retrograde orbit. The team hasn't been able to determine yet if Bee-Zed is an icy comet or a rocky asteroid.

But their analysis—based on complex calculations and on observations through the Large Binocular Camera on the Large Binocular Telescope in Mt. Graham, Arizona, during a span of 300 days—show Bee-Zed is somehow able to maintain a stable orbit even as an outlier.

The calculations conducted by the team show the orbit has been stable for at least a million years and will be stable for at least a million more. Learning more about the asteroid provides another intriguing glimpse into previously unknown and unmapped features of our solar system. "The detective work has just begun," he said.

More information: Paul Wiegert et al. A retrograde co-orbital asteroid of Jupiter, *Nature* (2017). DOI: 10.1038/nature22029

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