Astronomer discusses the science behind that mysterious star you've heard so much about

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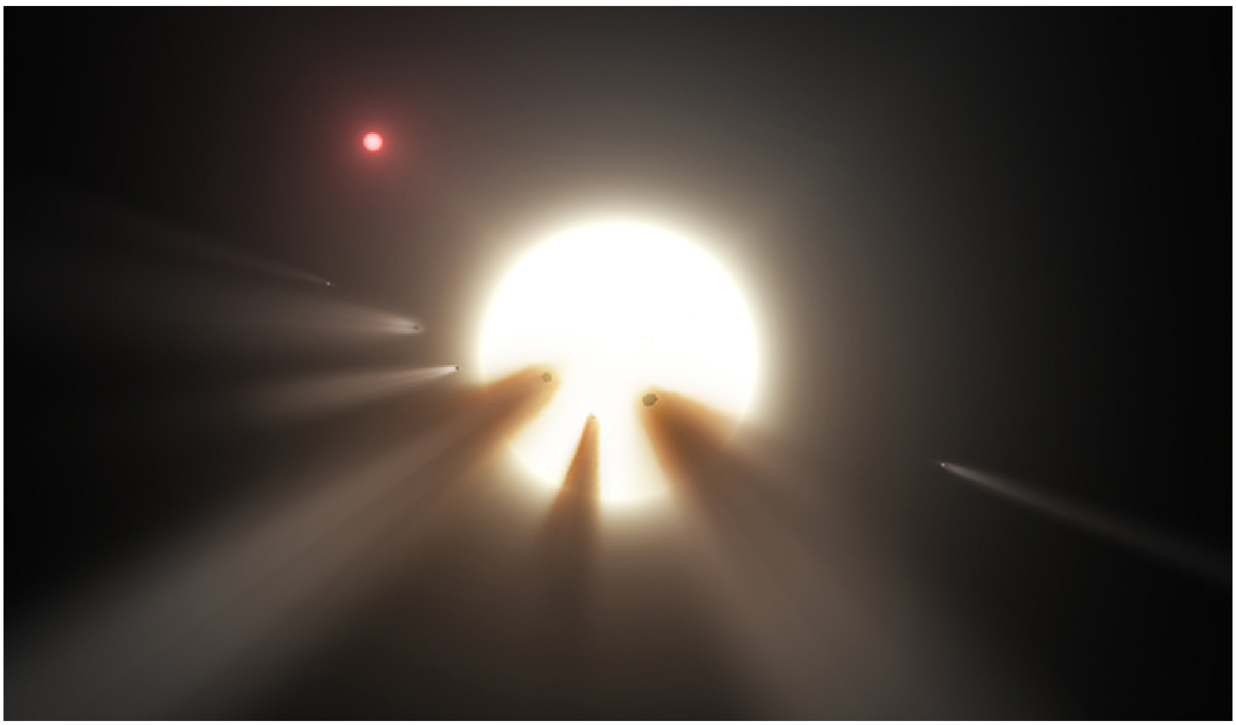

Credit: NASA / JPL-Caltech

A Yale-led team of astronomers has had its eye on a particularly bright star whose dramatic dips in energy output may be the result of fragmented, extra-solar comets buzzing past the star.

The star in question, KIC 8462852, was a source of much speculation during the course of NASA's Kepler space mission. Kepler's primary goal is to find Earth-like planets located outside of our solar system. But the speculation intensified greatly in recent months, as news stories pondered whether the phenomenon had an extra-terrestrial explanation. Now, additional data from NASA's Spitzer Space Telescope supports the "swarm of comets" theory.

YaleNews recently met with Yale postdoctoral researcher Tabetha Boyajian, first author of the original study on KIC 8462852, to talk about what her team actually found.

Also of note—Boyajian's colleagues have taken to calling it "Tabby's star."

How far away is Tabby's star and why did it attract your interest?

This star is about 1,400 light years away. For comparison, the Earth is only about 8½ light minutes away from the Sun. Proxima Centauri, the closest star to the Sun, is 4.22 light years away. The Kepler light curve for this star (KIC 8462852) piques everyone's interest—it is truly unique!

How does this relate to your work with Planet Hunters, the citizen science program?

Planet Hunters is a citizen science project started here at Yale (the principal investigator is astronomy professor Debra Fischer) in 2010. It is a web-based interface designed for users to view light curves from the Kepler mission and identify signals of transiting planets.

I am a science team member of Planet Hunters, which means I am responsible for the organization, data analysis, and publication of Planet Hunter discoveries. In addition, I lead a "guest observer" program, which basically manages projects not directly related to transiting exoplanets in the Kepler data. Such "guest observer" projects typically come out of the back-end utility of the Planet Hunters site called Talk. Talk is where users can discuss any aspects of a light curve further. It was through the Talk interface that KIC 8462852 was first identified by our volunteers. Within Talk, KIC 8462852's light curve was a very popular discussion, and this was brought to the science team's attention as a possibly interesting object to follow up.

Why do you believe it is most likely that comets are the cause of the unusual data from KIC 8462852? Are comets large enough to cause such large-scale dimming?

Exocomets are the most promising scenario that fits all the data we have in hand. Comets themselves are small, so at first it seems unlikely to have such large dips in an object's brightness (down by 22%). The scenario we propose invokes a swarm of exocomet fragments, broken up in a recent collision, that are blocking the starlight. Aside from the true size of the object causing the dimming, there are many variables, including the opacity (transparency) of the orbiting material, and geometric orientation of the orbit at our viewing angle—all of which will influence the depths and shapes of the dips.

At this point, however, no detailed modeling has been done to try to reproduce the unique dips in the Kepler light curve, and we are currently seeking more data on the exocomet possibility.

What theories were you able to rule out?

The paper discussed many scenarios that were not consistent with the data we have for this star. This includes scenarios that the variability is caused by something intrinsic to the star, such as star spots rotating in and out of view, as well as extrinsic to the star, such as something in orbit around the star getting in the way and intermittently blocking the star's light. The latter scenario is elaborated upon in detail in the paper, with several examples such as an asteroid belt, planetary collisions, and the presence of a transiting object with rings.

What has been the biggest challenge in deciphering the data?

The biggest challenge was developing a single hypothesis that could explain all the observed dimming events. Many scenarios discussed would match one set of features observed, but not any of the others.

On a personal level, how exciting is it to try to find answers to questions such as the ones posed by KIC 8462852?

Science is addictive. To be the first person on Earth to say something about any cosmic question is a rush!

Provided by Yale University