Breakthrough Listen to search for intelligent life around weird star

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Tabby's star has provoked so much excitement over the past year, with speculation that it hosts a highly advanced civilization capable of building orbiting megastructures to capture the star's energy, that UC Berkeley's Breakthrough Listen project is devoting hours of time on the Green Bank radio telescope to see if it can detect any signals from intelligent extraterrestrials.

"The Breakthrough Listen program has the most powerful SETI equipment on the planet, and access to the largest telescopes on the planet," said Andrew Siemion, director of the Berkeley SETI Research Center and co-director of Breakthrough Listen. "We can look at it with greater sensitivity and for a wider range of signal types than any other experiment in the world. "

Breakthrough Listen, which was created last year with $100 million in funding over 10 years from the Breakthrough Prize Foundation and its founder, internet investor Yuri Milner, won't be the first to search for intelligent life around this star.

"Everyone, every SETI program telescope, I mean every astronomer that has any kind of telescope in any wavelength that can see Tabby's star has looked at it," he said. "It's been looked at with Hubble, it's been looked at with Keck, it's been looked at in the infrared and radio and high energy, and every possible thing you can imagine, including a whole range of SETI experiments. Nothing has been found."

While Siemion and his colleagues are skeptical that the star's unique behavior is a sign of an advanced civilization, they can't not take a look. They've teamed up with UC Berkeley visiting astronomer Jason Wright and Tabetha Boyajian, the assistant professor of physics and astronomy at Louisiana State University for whom the star is named, to observe the star with state-of-the-art instruments the Breakthrough Listen team recently mounted on the 100-meter telescope. Wright is at the Center for Exoplanets and Habitable Worlds at Pennsylvania State University.

The observations are scheduled for eight hours per night for three nights over the next two months, starting Wednesday evening, Oct. 26. Siemion, Wright and Boyajian are traveling to the Green Bank Observatory in rural West Virginia to start the observations, and expect to gather around 1 petabyte of data over hundreds of millions of

individual radio channels.

"The Green Bank Telescope is the largest fully steerable radio telescope on the planet, and it's the largest, most sensitive telescope that's capable of looking at Tabby's star given its position in the sky," Siemion said. "We've deployed a fantastic new SETI instrument that connects to that telescope, that can look at many gigahertz of bandwidth simultaneously and many, many billions of different radio channels all at the same time so we can explore the radio spectrum very, very quickly."

The results of their observations will not be known for more than a month, because of the data analysis required to pick out patterns in the radio emissions.

First reported in September 2015 by Boyajian, then a postdoc at Yale University, Tabby's star – more properly called KIC 8462852 – had been flagged by citizen scientists because of its unusual pattern of dimming. These volunteers were looking at stars as part of the internet project Planet Hunters, which allows the public to search for planets around other stars in data taken by NASA's Kepler spacecraft, which has been monitoring 150,000 stars for regular dimming that might indicate a planet had passed in front of it.

But while most such dimming by transiting planets is brief, regular and blocks just 1 or 2 percent of the light of the star, Tabby's star dims for days at a time, by as much as 22 percent, and at irregular intervals.

While Boyajian speculated in her 2015 paper that the irregular dimming might be explained by a swarm of comets breaking up as it approached the star, subsequent observations show the star, which is located about 1,500 light-years from Earth in the constellation Cygnus, is far more irregular than a comet swarm would produce. In fact, it seems to have been dimming at a steady rate for the past century.

Speculation eventually arose that the dimming was caused by a Dyson structure: a massive orbiting array of solar collectors that physicist Freeman Dyson once proposed would be a natural thing for a civilization to build as it needed more and more energy to power itself. Theoretically, such a structure could completely surround the star – what he termed a Dyson sphere – and capture nearly all the star's energy.

How likely is that? "I don't think it's very likely – a one in a billion chance or something like that – but nevertheless, we're going to check it out," said Dan Werthimer, chief scientist at Berkeley SETI. "But I think that ET, if it's ever discovered, it might be something like that. It'll be some bizarre thing that somebody finds by accident … that nobody expected, and then we look more carefully and we say, 'Hey, that's a civilization.'"

Breakthrough Listen is monitoring many other stars using three telescopes that can peer into all segments of the cosmos: the Parkes Telescope in Australia and the Green Bank Telescope to search for radio transmissions, and the Automated Planet Finder at Lick Observatory in California to search for optical laser transmissions.

Provided by University of California - Berkeley

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