The iconic Arecibo Telescope goes quiet after major damage

That’s a big dish! The Arecibo radio telescope in its salad days.

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Early Monday morning, a cable suspended over the Arecibo Telescope in Puerto Rico broke and left a 100-foot-long gash in the dish of the iconic radio telescope. The 3-inch-diameter cable also caused damage to the panels of the Gregorian dome that is suspended hundreds of feet above the dish and houses the telescope’s receivers. It is unclear what caused the cable to break or when radio astronomers using the telescope will be able to resume their research.

“This was an auxiliary cable used to support the weight of the platform, and we are in the process of assessing why it broke,” says Zenaida Kotala, the assistant vice president for strategic initiatives at the University of Central Florida, which manages the observatory. “We are working with engineers to determine a strategy for repairs. Our goal is to get the facility operational as soon as it is possible to do so safely.”

Astronomers have used the Arecibo radio telescope to study the cosmos since 1963. For most of its life, the observatory was far and away the largest telescope of its kind in the world. (It was only recently surpassed by China’s FAST radio

telescope.) Its 1,000-foot radio dish is built into a natural depression in the surrounding hills and acts like a giant ear listening for faint radio signals from galaxies far, far away.

“By being bigger, it’s simply more sensitive,” says Seth Shostak, the senior astronomer at the nonprofit SETI Institute, a leading research institution in the search for extraterrestrial intelligence. “Just as a larger optical telescope can see fainter objects, so too can a bigger radio telescope ‘see’ things that are fainter.”

The Arecibo radio telescope has been used for a wide range of science experiments and was at the center of a number of firsts that have changed our understanding of the universe. In 1994, astronomers studying a pulsar with Arecibo found the first evidence of a planet orbiting another star. Arecibo also detected the first millisecond pulsar, a type of rapidly rotating star that is used as an astrophysical clock in the hunt for gravitational waves, and the first repeating Fast Radio Burst, a brief pulse of high-energy radiation that scientists are only beginning to understand.

The history of the Arecibo telescope is also deeply entwined with the history of SETI. The planetary astronomer Frank Drake, who conducted the first radio SETI search the same year that construction on Arecibo began, served as the observatory’s director for years. In 1974, he and Carl Sagan used the telescope to transmit the world’s first interstellar message to a star system 12,000 light years away. It was a short pictorial message depicting humans, our DNA, and even the Arecibo dish itself. Since then, Arecibo’s SETI activities have mostly been focused on listening for ET. (Although, in 2009, the artist Joe Davis effectively plugged his iPhone into the dish and used it to transmit a second interstellar message.)

“A singular asset in SETI”

“We were extremely saddened by the news out of Arecibo,” says Andrew Siemion, the director of the Berkeley SETI Research Center. “Arecibo is a singular asset in SETI and we very much look forward to its return to science operations.” For years, Siemion and his colleagues at Berkeley collected radio data from Arecibo for SETI@Home, a distributed computing project that allowed anyone with an Internet connection to help in the search for intelligent aliens. Earlier this year, the SETI@Home project stopped pulling in new data from Arecibo and other radio telescopes so its researchers could focus on analyzing the data already collected.

Arecibo has taught scientists a lot more about our own solar system, too. When it’s not listening for aliens or pulsars, the radio observatory can be used as a planetary radar. It generates a powerful beam of radio energy and bounces it off an object of interest in our solar system, like a planet or an asteroid. “Its ability to send and receive radar signals makes it incredibly valuable to the planetary science community,” says Bruce Betts, chief scientist at the nonprofit Planetary Society. By studying the radio reflections from these objects, planetary scientists can get detailed information about their orbits, map their surfaces, or study their composition. In fact, the telescope plays a crucial role in NASA’s planetary defense program, which is tasked with detecting and mitigating threats from giant killer asteroids.

But all these scientific operations will have to be put on pause until Arecibo’s dish is repaired. Although this is the most damage inflicted on the observatory in recent memory, it’s not the first time the telescope has taken a hit. In 2014, an earthquake damaged a cable at the observatory, and Hurricane Maria battered the telescope just a few years later. But Ramon Lugo, the director of the Florida Space Institute at the University of Central Florida, says previous damage to the

Arecibo telescope isn’t really comparable to what happened this week with the broken cable. “Nothing like this has ever occurred before,” Lugo says.

Money problems

The damage inflicted on Arecibo by Hurricane Maria came at a particularly inopportune time for the observatory, which was beset with major funding problems at the time. Arecibo is primarily supported by grants from the National Science Foundation, which awarded the observatory $12.3 million in emergency funds for hurricane-related repairs in 2018. Kotala says it’s still unclear how much it will cost to repair the damage from the broken cable, but she is confident that the observatory will get the funding it needs.

“We have had numerous challenges since we started operations and management of the observatory, but the team and our local community have been resilient and continue to make progress,” Kotala says. “We have the complete support of both NSF and our NASA stakeholders to make the needed repairs to return to full operational capability. This is another opportunity to show the world that this team can weather the storm.”

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