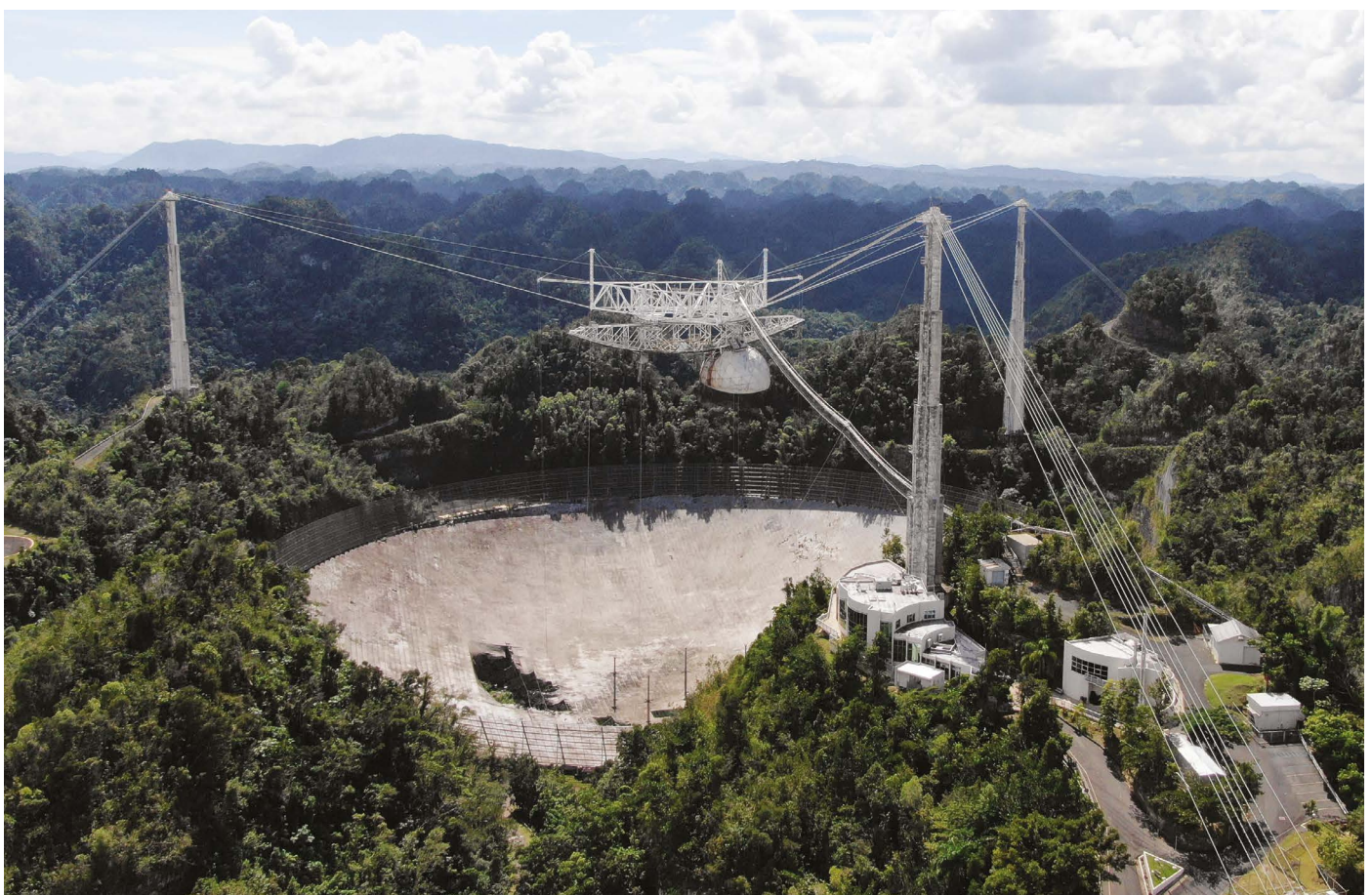


News in focus



ARECIBO OBSERVATORY/UNIV. CENTRAL FLORIDA

A main cable broke in half on 6 November and tore large gashes through a central portion of the telescope's dish.

LEGENDARY ARECIBO TELESCOPE WILL CLOSE FOREVER — SCIENTISTS ARE REELING

Cable breaks caused damage too extensive to repair, ending an era in astronomical observation.

By Alexandra Witze

One of astronomy's most renowned telescopes — the 305-metre-wide radio telescope at Arecibo, Puerto Rico — is closing permanently. Engineers cannot find a safe way to repair it, after two cables supporting the structure broke suddenly and catastrophically, one in August and one in early November.

It is the end of one of the most iconic and scientifically productive telescopes in the history of astronomy — and scientists are

mourning its loss.

"I don't know what to say," says Robert Kerr, a former director of the observatory. "It's just unbelievable."

"I am totally devastated," says Abel Méndez, an astrobiologist at the University of Puerto Rico at Arecibo who uses the observatory.

The Arecibo telescope, which was built in 1963, was the world's largest radio telescope for decades and has historical and modern importance in astronomy. It was the site from which astronomers sent an interstellar radio message in 1974, in the hope that any

extraterrestrials might hear it, and from which the first confirmed extrasolar planet was discovered, in 1992.

It has also done pioneering work in exploring many phenomena, including near-Earth asteroids and the puzzling celestial blasts known as fast radio bursts. All those lines of investigation have now been shut down for good, although limited science will continue at some smaller facilities on the Arecibo site.

The cables that broke helped to support a 900-tonne platform of scientific instruments, which hangs above the main telescope dish.

News in focus

The first cable slipped out of its socket and smashed panels at the edge of the dish, but the second broke in half and tore huge gashes in a central portion of the dish.

If any more cables fail – which could happen at any time – the entire platform could crash into the dish below. The US National Science Foundation (NSF), which owns the Arecibo Observatory, is working on plans to lower the platform in a safe, controlled fashion.

But those plans will take weeks to develop. “Even attempts at stabilization or at testing the cables could result in accelerating the catastrophic failure,” said Ralph Gaume, director of the NSF’s astronomy division, at a 19 November media briefing.

So the NSF decided to close the Arecibo dish permanently. “This decision is not an easy one to make, but safety is the number-one priority,” said Sean Jones, head of the NSF’s mathematical- and physical-sciences directorate.

The closure comes as a shock to the wider astronomical community. A social-media campaign with the hashtag #WhatAreciboMeansToMe sprung up almost immediately, with astronomers, engineers and other scientists – many from Puerto Rico – sharing stories of how the observatory had shaped their careers. “Losing the Arecibo Observatory would be a big loss for science, for planetary defence and for Puerto Rico,” said Desireé Cotto-Figueroa, an astronomer at the University of Puerto Rico Humacao, in an e-mail before the closure was announced.

What went wrong

NSF officials insist that the cable failures came as a surprise. After the first, engineering teams spotted a handful of broken wires on the second cable, which was more crucial to holding up the platform, but they did not see it as a major problem because the weight it was carrying was well within its design capacity. “It was not seen as an immediate threat,” says Ashley Zauderer, programme director for Arecibo at the NSF.

But that main cable, which was installed in the early 1960s, had apparently degraded over time. Over the years, external review committees have highlighted the ongoing need to maintain the ageing cables. Zauderer said that maintenance in recent years had been completed according to schedule.

Before this year, the last major cable problems at the observatory were in January 2014, when a magnitude-6.4 earthquake caused damage to another of the main cables, which engineers repaired. The ageing structure has sustained other shocks in recent years, including damage to an antenna and the dish caused by Hurricane Maria in 2017.

There is no estimate yet for the cost of decommissioning the telescope.

The science that has ground to a halt includes Arecibo’s world-leading asteroid



Broken wires on the second failed cable.

studies. The telescope pinged radio waves at near-Earth asteroids to reveal the shape and spin of these threatening space rocks. Not having it “will be a big loss”, says Alan Harris, an asteroid scientist in La Canada, California. (China’s Five-hundred-meter Aperture Spherical Telescope (FAST), which opened in 2016, does not currently have the ability to do such radar studies.)

Some of the observatory’s scientific projects could be transferred to other facilities, Gaume said – and he expects scientists to propose where to move their research. Much of the work conducted at Arecibo, however, could be done only with its unique array of astronomical instrumentation. “The Arecibo Telescope is irreplaceable,” said a statement from two major US radio-astronomy organizations,

the National Radio Astronomy Observatory in Charlottesville, Virginia, and the Green Bank Observatory in West Virginia.

Small amounts of science will continue at other portions of the Arecibo observatory, which encompasses more than the 305-metre dish. For instance, two lidar facilities shoot lasers into the skies to study atmospheric phenomena.

The Arecibo telescope had been upgraded regularly, with several new instruments slated for installation in the coming years. “The telescope is in no way obsolete,” says Christopher Salter, an astronomer at the Green Bank Observatory, who worked at Arecibo for years.

Planned upgrades are now presumably on hold, including a US\$5.8-million antenna that was being developed for the telescope’s platform and would have massively increased its sensitivity. Brian Jeffs, an engineer at Brigham Young University in Provo, Utah, who heads the project, says his team expects to discuss options for its future with the NSF eventually. “Our greatest concerns are for the wonderful scientific, technical, management and support staff” of the observatory, he says.

The observatory is a major centre for science education in Puerto Rico, where it has fostered the careers of many astronomers and engineers. And it has become a part of the pop-culture lexicon, featuring in major movies such as *Contact* (1997), which was based on a novel by astronomer Carl Sagan, and the 1995 James Bond film *GoldenEye*.

The most recent major radio-telescope disaster happened in 1988, when a 300-foot-wide antenna at the Green Bank Observatory collapsed one night, owing to structural failure.

ARECIBO OBSERVATORY/UNIV. CENTRAL FLORIDA

CAN DOGS SMELL COVID? HERE’S WHAT THE SCIENCE SAYS

Canines seem to detect infections accurately, but researchers say large-scale studies are needed.

By Holly Else

Asher is an eccentric, Storm likes sunbathing and Maple loves to use her brain. All three could play a part in controlling the COVID-19 pandemic, but they are not scientists or politicians. They are dogs.

And they are not alone. Around the world, canines are being trained to detect the whiff of COVID-19 infections. Dog trainers are claiming extraordinary results – in some cases,

they say that dogs can detect the virus with almost perfect accuracy. Scientists involved suggest that canines could help to control the pandemic because they can screen hundreds of people an hour in busy places such as airports or sports stadiums, and are cheaper to use than conventional testing methods such as the RNA-amplification technique RT-PCR.

But most of these findings have not yet been peer reviewed or published, making it hard for the wider scientific community to evaluate the claims. Researchers working on more