ASTRONOMY

Legendary radio telescope hangs in the balance

US National Science Foundation looks to slash funding for Puerto Rico's Arecibo Observatory.

BY ALEXANDRA WITZE, GRAPEVINE, TEXAS

It is the radio telescope that hunts killer asteroids, probes distant cosmic blasts and decades ago sent Earth's most powerful message to the stars. Yet the storied Arecibo Observatory, an enormous aluminium dish nestled in a Puerto Rican sinkhole, might soon find itself out of the science game.

The US National Science Foundation (NSF), which owns the observatory, wants to offload the facility to free up money for newer ones. In the coming weeks, it will ask for ideas about how Arecibo might be managed if the NSF reduces its current US$8.2-million annual contribution. By May, the agency plans to release a final environmental-impact statement, a federally mandated analysis of the effects of various scenarios — from continuing to run Arecibo to mothballing or even demolishing its iconic dish. Soon after that, the NSF will decide which path to take.

Arecibo advocates are not going to let the telescope die without a fight. On 4 January, they pressed their case at a meeting of the American Astronomical Society in Grapevine, Texas — arguing that Arecibo is putting out some of the best science it has ever done, and that the NSF is moving too quickly to divest itself of an astronomical treasure.

"Arecibo definitely has a future," says Francisco Cordova, the observatory's director. "Though it will be a different future."

Arecibo is playing a key part in illuminating the mystery of fast radio bursts, which are emerging as a completely new class of celestial phenomenon. And at the astronomy meeting, observatory scientists revealed a previously unknown contributor to the Universe's cosmic microwave background glow — cold electrons — plus a pair of pulsars that has surprisingly erratic radio emissions.

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Researchers hope that there is a way to stop the iconic Arecibo Observatory from closing down.

"It is still a state-of-the-art observatory," says Nicholas White, senior vice-president for science at the Universities Space Research Association in Columbia, Maryland, which helps to manage Arecibo for the NSF.

NSF officials agree. But they say they need money for new projects such as the Large Synoptic Survey Telescope, which is under construction in Chile (see 'On the block'). A 2012 review of the NSF's astronomy portfolio recommended cutting support for some of its smaller and older facilities. Although Arecibo was not among them, the report recommended that the NSF evaluate the facility's status later in the decade.

Some of the observatories targeted in the review have found potential partners: New Mexico State University in Las Cruces is leading an effort to take over the Dunn Solar Telescope in Sunspot, New Mexico. Others remain in limbo, including the 100-metre radio telescope in Green Bank, West , where university partners have offered limited help.

In October, the NSF released a draft environmental impact statement for Arecibo that outlines how various management options would affect everything from endangered plants to local tourism. The NSF would prefer to find collaborators to shoulder most of the cost of operating the observatory for science purposes. But the draft statement includes the possibility of shuttering the ▶

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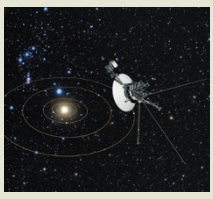

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ON THE BLOCK
The US National Science Foundation is planning to divest itself of older telescopes to free up money for newer facilities.

Telescope	Location	Status
Arecibo Observatory (radio)	Puerto Rico	Environmental-impact study under way
Green Bank Observatory (radio)	West Virginia	Has left National Radio Astronomy Observatory; environmental impact study underway
Long Baseline Observatory (radio)	10 US locations	Has left National Radio Astronomy Observatory; part-time funding from US Navy
McMath–Pierce Solar Telescope (solar)	Arizona	Likely to close this year
Mayall 4-Meter Telescope (optical)	Arizona	To transition to Department of Energy for dark-energy studies
WIYN 3.5-metre observatory (optical)	Arizona	NSF to partner with NASA for exoplanet studies
Global Oscillation Network Group (solar)	Six locations worldwide	National Oceanic and Atmospheric Administration to share operating costs
Richard B. Dunn Solar Telescope (solar)	New Mexico	Likely to transition to consortium led by New Mexico State University
SOAR 4.1-metre telescope (optical and near-infrared)	Chile	To be reviewed

SOAR, Southern Astrophysical Research; WIYN, Wisconsin–Indiana–Yale–National Optical Astronomy Observatory.

SOURCE: NSF

facility, and even details which explosive would be needed to dismantle the 305-metre-wide dish.

NSF officials included this bleak option to satisfy federal rules that require them to describe the environmental impact of all possible outcomes. "We specifically leaned towards making things look a bit more drastic," says James Ulvestad, head of the NSF's astronomy division.

Gravitational-wave astronomers are among those who are unhappy about the idea of Arecibo going offline. The international NANOGrav consortium uses about 850 hours of Arecibo time each year to discern how ripples in space-time affect radio pulsars. Between Arecibo and Green Bank, the team is just now reaching the sensitivity at which it should be able to detect gravitational waves. "We're so close," says Xavier Siemens, an astrophysicist at the University of Wisconsin–Milwaukee. "Losing Arecibo would mean losing US leadership in the field."

Arecibo also has a unique role in stimulating public interest in science, says Edgard Rivera-Valentín, a planetary radar specialist at the observatory. Like many Puerto Ricans, he first visited Arecibo as a child, on a family trip. "It just blew me away," he says. "I knew pretty much then that I wanted to do astronomy."

The NSF pays for roughly two-thirds of Arecibo's $12-million annual budget. Half of that comes from its astronomy division and half from its atmospheric and geospace sciences division, which uses Arecibo to study Earth's ionosphere. The remainder comes from NASA, which tracks near-Earth asteroids from Arecibo and would probably keep doing so if other collaborators stepped in to make up for NSF cutbacks.

Arecibo's current operating contract ends in March 2018. After that, new approaches to make ends meet could include charging scientists hourly rates to use the observatory, instead of having them apply for time through federal agencies. "This is where the rubber hits the road," says White. ■

DRUG DISCOVERY

Chemists warn against deceptive molecules

Spice extract curcumin dupes assays and leads some drug hunters astray.

BY MONYA BAKER

Inside the golden-yellow spice turmeric lurks a chemical deceiver: curcumin, a molecule that is widely touted as having medicinal activity, but which also gives false signals in drug screening tests. For years, chemists have urged caution about curcumin and other compounds that can mislead naive drug hunters.

Now, in an attempt to stem a continuing flow of muddled research, scientists have published the most comprehensive critical review yet of curcumin — concluding that there's no evidence it has any specific therapeutic benefits, despite thousands of research papers and more than 120 clinical trials. The scientists hope that their report will prevent further wasted research and alert the unwary to the possibility that chemicals may often show up as 'hits' in drug screens, but be unlikely to yield a drug.

KAI WONG/ISTOCK/GETTY

Turmeric — a source of wasted effort and funding.

"Curcumin is a cautionary tale," says Michael Walters, a medicinal chemist at the University of Minnesota in Minneapolis, and lead author of the review (K. M. Nelson *et al. J. Med. Chem.* http://dx.doi.org/10.1021/acs.jmedchem.6b00975; 2017), published on 11 January. Commonly used drug screens detect whether a chemical latches on to a binding site of a protein implicated in disease — a hint that it may be the starting point for a drug. But some molecules, such as curcumin, seem to show such specific activity when there is none. The molecules may fluoresce naturally, foiling attempts to use fluorescence as a signal of protein binding. They may disrupt cell membranes, duping assays that try to spot drugs targeting specific cell-membrane proteins. And