

# Radio Telescope And Its Budget Hang in the Balance

By Rick Weiss  
Washington Post Staff Writer  
Sunday, September 9, 2007; A01

ARECIBO, Puerto Rico -- In the tangled forests of [Puerto Rico](#)'s steamy interior, suspended by steel cables strung from 300-foot towers, an array of antennas hangs above an aluminum bowl 1,000 feet in diameter that gazes into space.

Arecibo Observatory, the largest and most sensitive radio telescope on Earth, looks like a secret outpost built by aliens. In fact, one of its missions is to search the galactic frontier for signs of intelligent life -- a sci-fi goal that landed it a leading role in the [Jodie Foster](#) movie "Contact" and cameos in a [James Bond](#) flick.

But among astronomers, Arecibo is an icon of hard science. Its instruments have netted a decades-long string of discoveries about the structure and evolution of the universe. Its high-powered radar has mapped in exquisite detail the surfaces and interiors of neighboring planets.

And it is the only facility on the planet able to track asteroids with enough precision to tell which ones might plow into Earth -- a disaster that could cause as many as a billion deaths and that experts say is preventable with enough warning.

Yet, for want of a few million dollars, the future for Arecibo appears grim.

The [National Science Foundation](#), which has long funded the dish, has told the [Cornell University](#)-operated facility that it will have to close if it cannot find outside sources for half of its already reduced \$8 million budget in the next three years -- an ultimatum that has sent ripples of despair through the scientific community.

The squeeze is part of a larger effort to free up money for new ventures in astronomy -- projects that even Arecibo's depressed staff agrees ought to be launched. But many astronomers say that if Arecibo succumbs, the cause of death will be politics, not a lack of good science.

They note that states with major observatories, such as [New Mexico](#) and [West Virginia](#), have senators famous for their power over purse strings, some of whom are already gearing up to fight proposed cuts. By contrast, Puerto Rico, a commonwealth of the United States, has no senators. And its representative in the House, Resident Commissioner Luis G. Fortuño (R), does not have a vote.

"That makes a big difference," Fortuño said, adding that recent pleas by the observatory's director for financial help from Puerto Rico's government struck him as paradoxical, given the island's budget woes. Last summer, the government shut down temporarily for

lack of funds. The average income in Puerto Rico is half that in the poorest American state.

Astronomers from around the country are meeting in Washington this week to highlight the many scientific mysteries that Arecibo is in a unique position to plumb, but the effort may be "too little, too late," said Daniel Altschuler, a professor of physics at the University of Puerto Rico who was Arecibo's director for 12 years.

"I don't see any effective move toward saving Arecibo," said Altschuler, who calls the observatory "a monument to man's curiosity."

"But to let it die is just a tragedy," he said.

A visit to Arecibo is in many respects a voyage through time. It's not just the jarring contrast between the high-tech receiver and the untamed jungle around it, or the fact that the signals it detects from the edges of the universe are snapshots of events that happened 10 billion years ago, not long after the big bang.

The control room that overlooks the array, built in the 1960s, still has some of its original control panels featuring black plastic knobs as big as a child's hand and gauges reminiscent of [Flash Gordon](#) movies. Yet those throwbacks are surrounded by ceiling-high banks of equipment of astonishing sophistication, including atomic clocks that measure incoming signals to the million-billionths of a second -- evidence of the upgrades that over the decades have kept Arecibo at the forefront of radio astronomy.

The primary aim is to detect radio waves from sources throughout the Milky Way and beyond.

As scientists discovered in the 1930s, atomic particles whizzing around in space can emit radio waves of various forms and intensities. Those waves -- which, unlike visible light and other kinds of electromagnetic energy, easily penetrate cosmic dust and Earth's atmosphere -- tell scientists what kinds of matter and energy are out there and how they are behaving.

That kind of information pulls the veil from how the universe matured (unevenly, with lumps of unimaginable density and vast expanses far emptier than any vacuum on Earth); what it is made of (about 95 percent is "dark energy" and "dark matter," components that scientists know virtually nothing about); and what holds it all together (nobody understands what gravity really is), even as the universe expands.

The incoming radio waves, perhaps emitted by a distant collapsed supernova or bounced off an asteroid swinging around for an unwelcome rendezvous, reflect off Arecibo's enormous bowl, made of 39,000 3-by-6-foot aluminum panels, to be detected by an array of antennas aboard a 900-ton platform suspended hundreds of feet above the dish.

With the help of laser-guided cable-tension adjusters, the entire apparatus, as big as 26 football fields, maintains its position within a millimeter or so, despite tropical winds and temperature changes.

"It's an engineering marvel," said Robert B. Kerr, the observatory's site director. "It's embarrassing to have our hand out like this."

The cash crunch stems from a "senior review" completed last November at NSF. Its \$200 million astronomy division -- increasingly committed to ambitious, new projects but long hobbled by flat congressional budgets -- was facing a deficit of at least \$30 million by 2010.

"The ambitions of the astronomy community for new things was far outstripping the capacity of the federal budget to cover them," said Wayne van Citters, NSF's astronomy division director, who organized the independent review. The result was a tough-love ranking of priorities that hit Arecibo hardest but also put intense pressure on the New Mexico-based Very Long Baseline Array, a collection of 10 radio telescopes, whose staff was also told to start paying for half its costs or face closure in 2011.

Many astronomers have complained that the review did not take into account several crucial factors.

One is that Arecibo is home to what is widely regarded as the world's foremost upper atmosphere and "space weather" research center. Funded at about \$2 million by a separate NSF division, the center studies the impacts of solar flares on satellite and cellphone communication; evaluates climate change; and has developed methods for cleaning up the atmosphere after a nuclear attack.

If Arecibo's astronomy budget is killed, the atmospheric center would have to close, too.

Also ignored was Arecibo's planetary radar system -- the most powerful in the world -- which in the past year has made major discoveries about the surface of the moon, the core of Mercury and the forces that affect asteroids as they hurtle through space.

Perhaps most painful was the apparent lack of weight accorded to Arecibo's educational mission, said Jos? Alonso, chief of the self-supporting visitor center. Arecibo holds science camps for teachers and welcomes more than 100,000 guests a year, including 25,000 schoolchildren.

"Inspiration is something not so easy to measure," said Alonso, an astronomer turned educator. "Children run around, and it may not be obvious right away. But five years from now, some of them will say, 'Oh, I remember that telescope, and I want to study that.' "

He and others noted with some irony that one of NSF's core missions is to attract Hispanics and other minorities to science.

Many astronomers have said that the senior review was ordered a few years ago on the assumption that NSF's budget would be flat. In fact, it has been growing steadily and, under [President Bush](#)'s American Competitiveness Initiative, is now in line to be doubled. That justifies congressional intervention, supporters say.

"Earmarks get a bad rap, but this is a case when Congress should step up to prevent Arecibo's demise," said Louis D. Friedman, executive director of the Planetary Society, a [Pasadena, Calif.](#)-based nonprofit that advocates for space exploration.

Van Citters, the foundation's astronomy chief, acknowledged that the financial pressure seems to be easing and that the cost of decommissioning Arecibo could be far higher than the cost of operating it for many years. But he said the call for cuts, including the possible closure of the Very Long Baseline Array and Arecibo, was "prudent planning."

[Sen. Pete V. Domenici](#) (R-N.M.) is pushing to save the Very Long Baseline Array. In early August, he fired off a letter to NSF Director Arden Bement decrying the cutback. They are scheduled to meet this month, a Domenici spokesman said.

In West Virginia, the senior review called for cuts at the [Robert C. Byrd](#) Green Bank Telescope, but Jenny Thalheimer, spokeswoman for the Democratic senator from West Virginia, said she does not anticipate problems.

"In the past, there have been some battles with NSF, but Byrd always managed to get it funded," Thalheimer said.

Arecibo does have a voice on [Capitol Hill](#). [Rep. Dana Rohrabacher](#) (R-Calif.), an advocate for better tracking of near-Earth asteroids, has requested a hearing to highlight the need for good warning systems.

With advance notice, scientists say, they could either blast the approaching object off track or send up a massive, expendable spacecraft to ride alongside it, providing just enough gravitational force to nudge it off course.

If NSF will not cover Arecibo's budget gap, Rohrabacher said, [NASA](#) should.

"There are things in the NASA budget that are far less defensible than identifying and tracking objects coming from space that could cause colossal loss of lives on our planet," Rohrabacher said.

Driving beneath the giant dish in a rickety Jeep, director Kerr is not counting on Congress. So he continues to brainstorm.

Don't laugh, he said, but lately he has been thinking about naming rights.

"Imagine the word '[Google](#)' painted across that 19-acre dish," Kerr said. "What do you think that would be worth?"

