

# THIS WEEK

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## Under new management

*The mysterious benefactors who are about to take over the Arecibo radio telescope have an early success to celebrate — whoever they are.*

When the US National Science Foundation (NSF) drew up a plan to demolish its radio telescope near Arecibo, Puerto Rico, it did conclude that something positive would result — although it was only a minor and short-term benefit. Five specialists in explosives would need to spend a month on the Caribbean island, and, the NSF said in an environmental-impact statement last year, the local community could profit from what the visitors would spend on meals and lodging.

Hoteliers and restaurant owners aside, most of the local workers and researchers who help to keep the giant dish functioning breathed a sigh of relief last November, when the NSF announced that the telescope would remain standing. At least one partner organization had pledged to help fund it, solving a cash crunch at the decades-old facility.

The identity of the saviours is still a closely guarded secret (although everyone in the astronomy community has their own idea of the funders' identity, ranging from overseas agencies to universities). Whoever they are, they are sure to be smiling to themselves this week. Their new toy has shown what it can still do.

In a paper in *Nature* this week, astronomer Daniele Michilli of the University of Amsterdam and his colleagues describe how they used the Arecibo dish to track a mysterious signal from deep space called a fast radio burst (D. Michilli *et al.* *Nature* **553**, 182–185; 2018). These powerful but short-lived flashes of radio noise were first discovered a decade ago, but their source remains unknown. They are one of the biggest outstanding astrophysical mysteries today.

Most of these sources blaze into life just once and then vanish. But a fast radio burst in the constellation Auriga, first spotted in November 2012, has shown itself many times since. Indeed, Michilli and his team recorded at least 16 separate flashes of its activity. Each time, they gleaned a little more information about its probable origin.

The trick, it turns out, lies in looking at the polarization of radiation coming from the burst. The plane of polarization rotates when the light travels through a magnetic field, an effect first seen by physicist Michael Faraday in 1845. For the Auriga burst, the Faraday rotation is large and variable — suggesting that the light must be travelling through a highly magnetized environment.

Until now, this type of Faraday rotation has been seen only close to black holes. So one possible explanation for this fast radio burst is that something is producing radio emissions very near to a black hole. Imagine, perhaps, a dense neutron star burping out radiation that twists and rotates as it travels through its highly magnetized surroundings. The work is the most precise look yet at what could be powering fast radio bursts (or at least one of them).

The announcement of the discovery comes after a tumultuous couple of years for the Arecibo telescope. Alongside the uncertainty over its funding, the facility — like much of Puerto Rico — was battered and put temporarily out of action by Hurricane Maria last year. On restarting its science observations last November, the first

thing the big dish did was to return its gaze to Auriga.

Like many veteran science experiments, Arecibo has an impressive back catalogue. In cinema history, it's where Jodie Foster listened for aliens in 1997's *Contact*, and where Pierce Brosnan's James Bond dispatched villain Sean Bean in *GoldenEye* (1995). In scientific history, the telescope beamed a message meant for extraterrestrials to the globular star cluster M13 in 1974, and has probed dangerous near-Earth asteroids to help protect the planet from cosmic impacts.

**“The discovery comes after a tumultuous couple of years for the Arecibo telescope.”**

Now the NSF wants to free up money for newer astronomical facilities by offloading some of its older ones, including Arecibo. With the demolition plan nixed, the current funding arrangement will end in April and the NSF will officially hand the controls to the mystery newcomers, who have agreed to step in as the agency scales down its annual contributions from US\$8 million to \$2 million over the next 5 years. (NASA will continue to pay one-third of the observatory's costs.)

The dish that the benefactors get for their money is no longer the world's biggest telescope of its type. China switched on its larger Five-hundred-meter Aperture Spherical radio Telescope (FAST) in 2016, and the facility is already making headlines by chalking up discoveries — three new pulsars last month alone. But the sky is a big place, and there is plenty of science to go around. Arecibo is rightly safe from the dynamite for now. ■

## Science at sea

*Debate on a United Nations treaty to protect the open ocean offers an opportunity for scientists.*

In a rare diplomatic breakthrough — and good news for marine scientists and conservationists around the world — nations agreed in 2016 to protect a huge area of ocean off the coast of Antarctica from commercial fishing and other harmful activities. That success came only after years of failed discussions. It was followed by another positive step: in December, Arctic Council countries decided not to fish industrially in the Arctic Sea.

These are good signs. Still missing, though, is a more significant agreement — a mechanism that would allow governments to create marine reserves in ecologically crucial ocean regions beyond any national jurisdiction.

Could the United Nations Convention on the Law of the Sea