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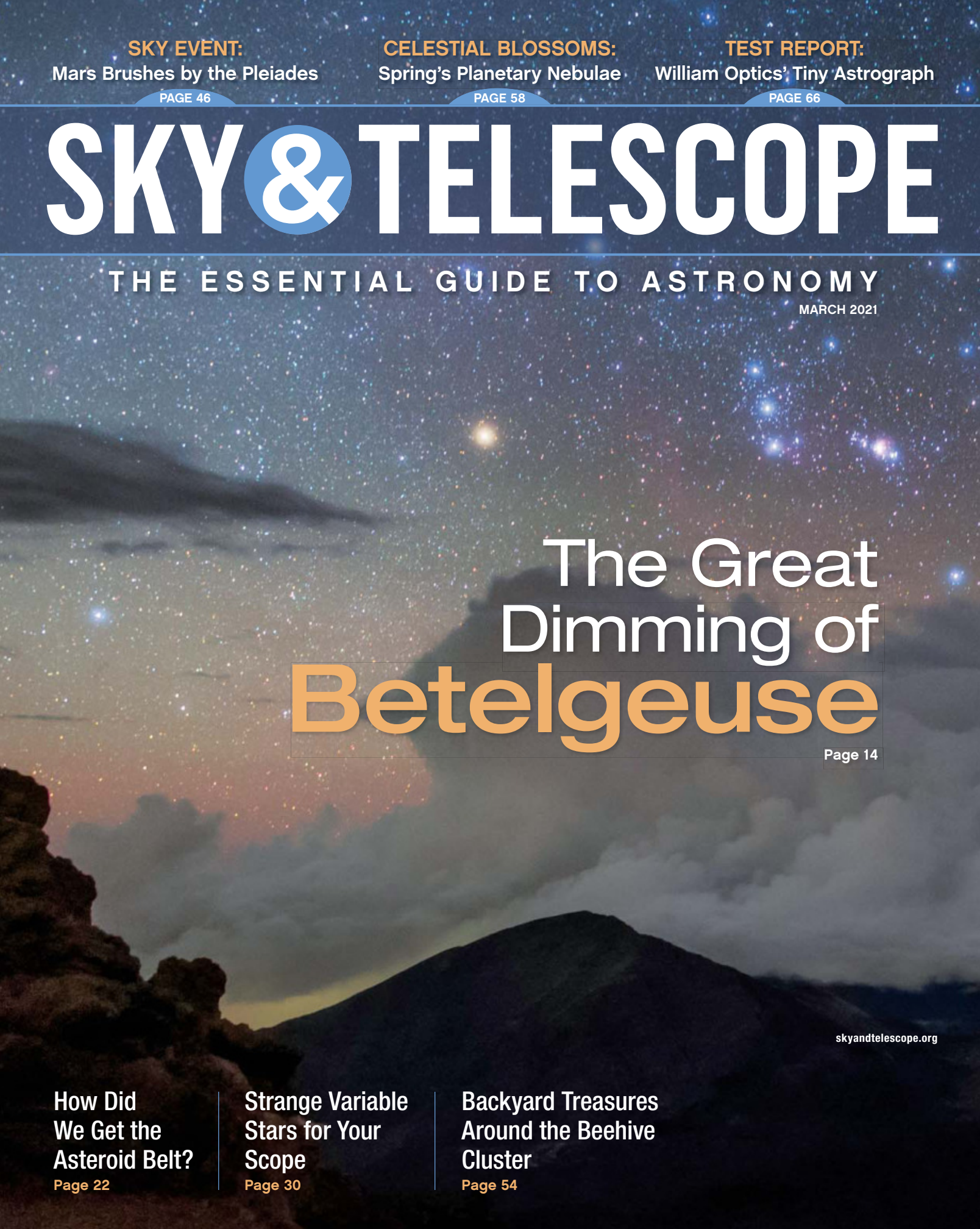
SKY & TELESCOPE

THE ESSENTIAL GUIDE TO ASTRONOMY

MARCH 2021



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◀ The 900-ton platform suspended above the Arecibo telescope fell 140 meters (450 feet), damaging the dish and surrounding structures.

OBSERVATORIES

Damaged Arecibo Telescope Collapses

AT 7:55 A.M. ON DECEMBER 1ST, a rumble echoed through the hilly terrain surrounding Arecibo, the iconic 305-meter (1,000-foot) radio telescope nestled in a natural sinkhole in Puerto Rico. The 900-ton receiver platform that had been suspended above the dish had come crashing down.

While no injuries occurred, the collapse ended hopes for a controlled dismantling of the telescope, which National Science Foundation (NSF) officials had announced less than two weeks earlier after two unexpected and devastating events that compromised the safety of the telescope.

First, an auxiliary cable, which helped suspend the receiver platform, tore out of its socket on August 10th, gashing the dish below. A redundant design transferred the load of that auxiliary cable to the four original cables and the remaining support cable. Engineers were called in to assess the damage and, after determining the structure was stable, to begin repairs.

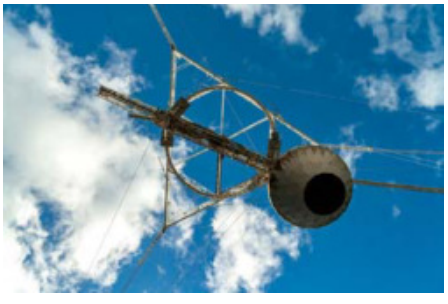
Replacement cables were on order, but before they could arrive, one of the main cables from the same tower snapped on November 6th. This unexpected second break caused engineers to doubt the entire structure's integrity.

"Any engineering approach to better understanding the strength left in the main cables involves considerable risk for human life and could in fact accelerate the uncontrolled collapse of the structure," said Ralph Gaume, director of NSF's Division of Astronomical Sciences.

Engineers warned that another cable break would cause "catastrophic failure." A representative from the engineering firm Thornton Tomasetti wrote in support of dismantling the telescope: "We believe the structure will collapse in the near future if left untouched." Drone footage in the days following the announcement showed additional breakages in the remaining cables.

Ultimately, the uncontrolled collapse happened before engineers could devise a plan for controlled decommmissioning. A preliminary assessment indicated that the top sections of all three support towers broke off. Then, as the platform fell, the cables also dropped, causing significant damage to the observatory's learning center.

The loss of the 57-year-old observatory came as a shock to the astronomy community (see page 12). Arecibo's huge collecting area, incredible sensitivity, and powerful radar capabilities enabled it to study everything from near-Earth asteroids to distant galaxies; scientists had also used the dish to investigate Earth's atmosphere.



▲ A ground view shows the suspended receiver platform in better days.

"I'm devastated," says Alessondra Springmann (University of Arizona), who had used the facility to characterize comets and asteroids. "There's nothing else like this in the world."

"Arecibo is so much more than a scientific instrument," says Edgard Rivera-Valentín (Lunar and Planetary Institute). "It has been an icon in Puerto Rico that has served to inspire generations of scientists."

"Pretty much every schoolchild on the island has been to Arecibo," Springmann says. "Everyone has had family who worked there, who helped build it. You can't have an observatory without the people, and the people also derive great benefit from the observatory being there."

Arecibo is also irreplaceable for scientists. "The Arecibo Observatory is the world's most powerful and most sensitive planetary radar," Rivera-Valentín explains. "This makes Arecibo invaluable for planetary defense."

Technically, Arecibo is the second-largest radio dish in the world — China's Five-hundred-meter Aperture Spherical Telescope, or FAST, recently broke the record that Arecibo had held for decades (*S&T:* Feb. 2017, p. 26). But FAST's suspended platform cannot hold the weight of radar instrumentation. Other radar-capable radio dishes, such as NASA's Goldstone, lack Arecibo's sensitivity and availability.

Over almost six decades, Arecibo survived multiple earthquakes, hurricanes, and funding struggles. Even upon the telescope's collapse, NSF officials have emphasized that they are not closing the Arecibo Observatory. The NSF continues to authorize repairs for the facility's 12-meter radio telescope and the roof of the LIDAR facility, used for geospace research. Both were damaged in 2017 during Hurricane Maria. The observatory's visitor center has managed to survive unscathed.

■ MONICA YOUNG

● **See drone footage of the collapse at https://is.gd/Arecibocollapse.**

ARECIBO: RICARDO ARDUENGO / AFP / GETTY IMAGES; RECEIVER PLATFORM: ALAN DYER