

## INNER WORKINGS

# After years of listening with detectors buried in Antarctic ice, IceCube researchers trace neutrino source

Nola Taylor Redd, *Science Writer*

Almost 4 billion years ago, a brilliantly bright galaxy fired a burst of lightweight, fast-moving particles toward Earth (1). Now, an observatory at the South Pole has traced those particles back to their source, potentially solving a century-old mystery about the waves of radiation produced somewhere outside the solar system that wash over our planet each day. But researchers will have to continue to examine the proposed source in multiple wavelengths to ensure they've identified the culprit.

Neutrinos are born from some of the most violent events in the universe, including explosive supernovae and the chaotic environment around supermassive black

holes. Tracing neutrinos back to their source can help scientists better understand these destructive events.

Deep in the ice of Antarctica, the IceCube Neutrino Observatory, launched in 2002, hunts for neutrinos, subatomic particles so weak that they usually pass through normal matter undetected (see [www.pnas.org/content/111/24/8699](http://www.pnas.org/content/111/24/8699)). Every second, roughly 100 billion neutrinos pass through 1 square centimeter on Earth, flying at nearly the speed of light. Many of them come from the sun. But the more powerful neutrinos are created outside of the galaxy, generated by a process researchers have only speculated about.



Researchers at the IceCube Neutrino Observatory, launched in 2002, have for the first time been able to trace some of the most energetic neutrinos back to their purported source, the blazar TXS 0506+056. Image courtesy of National Science Foundation/IceCube.

Published under the [PNAS license](https://www.pnas.org/licenses).

Published online July 18, 2018.



