

Antarctic neutrino-hunting project IceCube named Breakthrough of the Year by Physics World

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International high-energy physics research project IceCube has been named the 2013 Breakthrough of the Year by British magazine *Physics World*. The Antarctic observatory has been selected for making the first observation of cosmic neutrinos, but also for overcoming the many challenges of creating and operating a colossal detector deep under the ice at the South Pole.

"The ability to detect cosmic [neutrinos](#) is a remarkable achievement that gives astronomers a completely new way of studying the cosmos," says Hamish Johnston, editor of physicsworld.com. "The judges of the 2013 award were also impressed with the IceCube collaboration's ability to build and operate a huge and extremely sensitive detector in the most remote and inhospitable place on Earth."

Essentially a telescope in the ground, the IceCube Neutrino Observatory was completed in December 2010, after seven years of construction at the South Pole. But the idea of a huge detector buried in the ice was conceived a long time ago. And in the 1990s, the AMANDA detector was built as a proof of concept for IceCube. By January 2005, the first sensors of IceCube had already reached 2,450 metres below the Antarctic ice sheet, and a few weeks ago the IceCube Collaboration published the first evidence for a very high-energy astrophysical neutrino flux in *Science*.

"This is the beginning of a new era for astronomy," says University of Toronto physicist and IceCube collaborator Ken Clark. "This result opens up the ability to use neutrinos to explore our universe. These really are the ideal messenger particles since they can travel vast distances without stopping or slowing."

IceCube principal investigator is Francis Halzen, the Hildale and Gregory Breit Professor of Physics at the University of Wisconsin-Madison. As he envisioned, the Antarctic ice became the perfect medium to search for very high-energy neutrinos that, after travelling through the universe during millions—even billions—of years, haphazardly interact with the nucleus of a molecule of ice.

"I did not imagine that the science would be as exciting as building this detector," says Halzen. "Challenges were many, from deciphering the optical properties of ice that we have never seen, to drilling a hole to 2.5 kilometres in two days, and then repeating 86 times. The success of IceCube builds on the efforts of hundreds of collaborators around the world—from the design, the deployment in a harsh environment and the AMANDA prototype, to data harvesting and physics analysis."

IceCube is comprised of 5,160 digital optical modules suspended along 86 cables embedded in a cubic kilometre of ice beneath the South Pole. It detects neutrinos through the tiny flashes of blue light, called Cherenkov light, that are produced when neutrinos interact in the ice.

More information: The Hangout can also be viewed live on the *Physics World* YouTube channel at www.youtube.com/user/physicsworldTV/live

Provided by University of Toronto

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