

PHYSICS COLLOQUIUM

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IceCube: Opening a new window on the universe from the South Pole

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The IceCube project has transformed a cubic kilometer of natural Antarctic ice into a neutrino detector. The instrument detects more than 100,000 neutrinos per year in the GeV to PeV energy range. Among those, we have isolated a flux of high-energy neutrinos of cosmic origin. We will explore the IceCube telescope and the significance of the discovery of cosmic neutrinos. We recently identified their first source: alerted by IceCube on September 22, 2017, several astronomical telescopes pinpointed a flaring galaxy powered by an active supermassive black hole, as the source of a cosmic neutrino with an energy of 290 TeV. Most importantly, the large cosmic neutrino flux observed implies that the Universe's energy density in high-energy neutrinos is close to that in gamma rays, suggesting that the sources are connected and that a multitude of astronomical objects await discovery.