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THE ICECUBE PROJECT: A NEW VIEW OF THE UNIVERSE FROM THE SOUTH POLE

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An overview of the design, science goals, and status of the IceCube project will be presented. The international IceCube collaboration is constructing a neutrino telescope consisting of two coupled arrays at the South Pole. Neutrinos are tracked indirectly by observing the motion of charged particles produced when neutrinos interact near or in the detector. The resulting high-energy particles produce light as they travel through ice, which is captured by digital optical modules consisting of glass spheres that hold photomultipliers and the electronics needed to digitize and time-stamp the signal in situ. The deep array will have strings of 60 digital optical modules, 17 vertical meters apart, from 1450 to 2450 meters below the ice surface. Eighty strings are to be placed 125 meters apart in a triangular grid, resulting in a cubic kilometer subsurface array. Two approximately 2.3 m^3 gallon ice tanks with two digital optical modules each are deployed at the surface of each string to form a surface array. Both arrays use the timing and brightness of the light to measure the direction and energy of the particles. The deep array will primarily look for neutrino events and the companion surface array will measure cosmic rays for calibration, science, and veto purposes.

In addition to the potential for the discovery of new phenomena, the detection of extra-terrestrial high-energy neutrinos from cosmic objects like Supernovae Remnants, Micro-quasars, Active Galactic Nuclei, or Gamma Ray Bursts would provide incontrovertible evidence for the acceleration of charged hadrons. High-energy neutrinos can also be used to search for dark matter trapped in the Earth or Sun, and study other particle physics topics like supersymmetry, the search for extra dimensions, and exotic phenomena.

After the recently completed 2005-06 austral summer season, the IceCube array consists of 9 strings and 32 surface tanks. A summary of the performance of the most recently deployed equipment will be provided, along with a discussion of the plans for the succeeding years.