

Group A

What are neutrinos and what are some big questions about neutrinos?

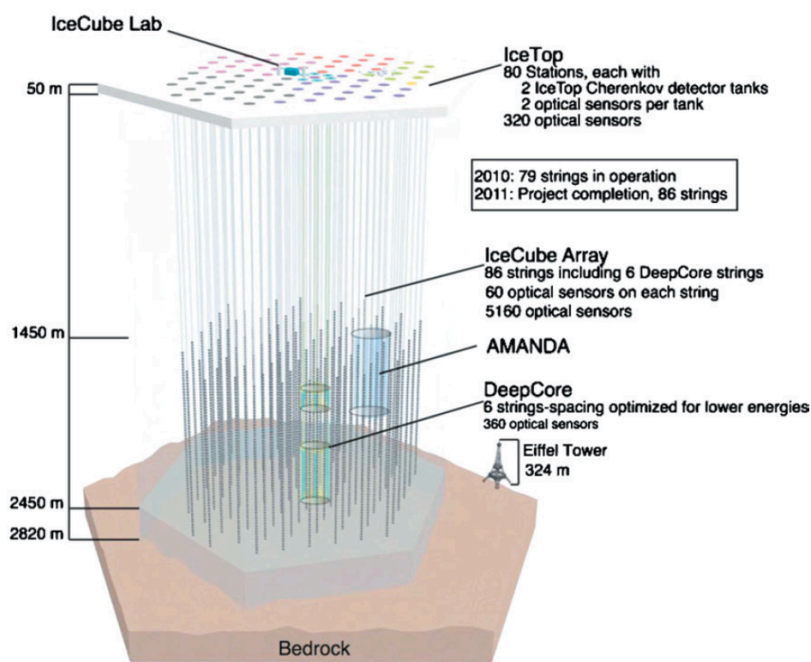
Miniscule neutral particles which can be produced in Beta Decay. Theorized to satisfy conservation of energy and later actually(physically) discovered. Originally thought to be massless, it was observed that neutrinos oscillate between three types (electron, muon and tau). Massless objects do not oscillate - so neutrinos therefore DO contain a small amount of mass.

Neutrinos do not usually interact w/other types of matter - something about black holes and dark matter and hints ... yadda, yadda. <https://physics.aps.org/articles/v15/77>

What are some neutrino experiments other than the NOvA experiment? Pick a few and describe them in more detail.

Ice Cube, Minos, “Dune”, Bell, Minerva, Kamiokande, Boone(s),

IceCube: The **IceCube Neutrino Observatory** (or simply **IceCube**) is a [neutrino observatory](#) constructed at the [Amundsen–Scott South Pole Station](#) in [Antarctica](#).^[1] The project is a recognized [CERN](#) experiment (RE10).^{[2][3]} Its thousands of sensors are located under the Antarctic ice, distributed over a [cubic kilometre](#).

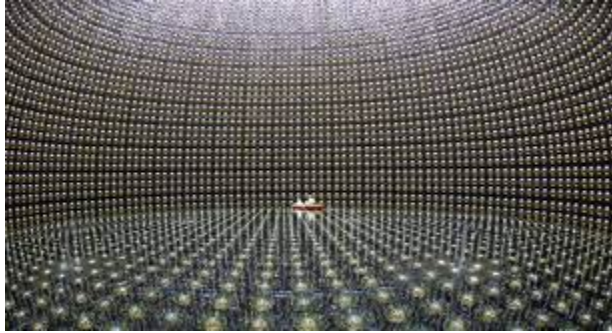


MINOS: **Main injector neutrino oscillation search (MINOS)** was a [particle physics](#) experiment designed to study the phenomena of [neutrino oscillations](#), first discovered by a [Super-Kamiokande](#) (Super-K) experiment in 1998. [Neutrinos](#) produced by the [NuMI](#) ("Neutrinos at Main Injector") [beamline](#) at [Fermilab](#) near [Chicago](#) are observed at two detectors, one very close to where the beam is produced (the *near detector*), and another much larger detector 735 km away in northern [Minnesota](#) (the *far detector*).



Kamiokande: The **Kamioka Observatory**, [Institute for Cosmic Ray Research](#) (神岡宇宙素粒子研究施設, *Kamioka Uchū Soryūshi Kenkyū Shisetsu*, Japanese pronunciation: [\[kamioka utɕuː soriɯ̥ːɕi kenkiɯː ɕise̞ˈtɕu\]](#)) is a [neutrino](#) and [gravitational waves](#) laboratory located underground in the Mozumi mine of the [Kamioka Mining and Smelting Co.](#) near the Kamioka section of the city of [Hida](#) in [Gifu Prefecture](#), [Japan](#). A set of groundbreaking neutrino experiments have taken place at the observatory over the past two [decades](#). All of the experiments have been very large and have

contributed substantially to the advancement of [particle physics](#), in particular to the study of [neutrino astronomy](#) and [neutrino oscillation](#).



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