

Grant to Design Neutrino Detector

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(PhysOrg.com) -- A consortium led by UC Davis physics professor Robert Svoboda will design the world's largest neutrino detector under a \$4.4 million contract recently awarded by the National Science Foundation.

The detector will contain about 330,000 tons of ultrapure water 4,800 feet below ground in the former Homestake goldmine in South Dakota. It will be about 15 times bigger than the current largest neutrino experiment, the Super-Kamiokande detector in Japan.

"If our design is approved and construction is funded, this will be the largest [particle physics](#) experiment in the U.S. in the next decade," Svoboda said.

The experiment will test whether [neutrinos](#) violate a principle of physics called matter/antimatter symmetry. If neutrinos violate this principle, they may be the cause of why there is so much more matter than antimatter in our "everyday" universe.

Neutrinos are fundamental particles with almost no mass, and so insubstantial that most pass through the planet without stopping. By placing the detector deep underground, the researchers can block out almost all other radiation except neutrinos.

When a charged particle passes through water, it gives off a flash of [ultraviolet light](#) that can be captured by sensitive detectors. Those flashes of light give information about the type of particle, its speed and

direction.

The neutrino beam will be generated at Fermilab in Batavia, Ill., and pass 800 miles through the Earth to the detector. The neutrinos and antineutrinos may behave differently when transmitted over a long distance, and such a difference could have profound implications for how our universe began in the Big Bang.

Theory predicts that matter and antimatter, equal and opposite in every way, should annihilate each other when they meet. But there seems to be far more matter than [antimatter](#) in our universe.

"If neutrinos don't respect symmetry, they might have tipped the scale" toward matter, Svoboda said.

In addition to UC Davis and [Fermilab](#), the design phase of the project includes researchers at UC Berkeley, the Argonne and Brookhaven national laboratories, UC Irvine, the California Institute of Technology, Drexel University, Duke University, the University of Maryland, the University of Minnesota, the University of Pennsylvania, Rensselaer Polytechnic Institute, the University of South Carolina, and the University of Wisconsin.

The design phase of the project will run until 2012. If the agency approves the design and funds construction, the experiment could begin collecting data in 2017, Svoboda said.

Provided by UC Davis ([news](#) : [web](#))

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