Sudbury Neutrino Observatory wins first Pulanyi Award

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[作者] Los Alamos National Security
[单位] Los Alamos National Security
[简介] November 15, 2005. Scientists from Los Alamos National Laboratory are part of an international collaboration of researchers at the Sudbury Neutrino Observatory (SNO) receiving the inaugural John C. Polanyi Award for its groundbreaking research on neutrinos. The $250,000 award, named for Canadian Nobel Laureate John C. Polanyi, is sponsored by Canada's Natural Sciences and Engineering Research Council.
[关键词] Sudbury Neutrino Observatory;Polanyi Award;neutrinos

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Scientists from Los Alamos National Laboratory are part of an international collaboration of researchers at the Sudbury Neutrino Observatory (SNO) receiving the inaugural John C. Polanyi Award for its groundbreaking research on neutrinos. The $250,000 award, named for Canadian Nobel Laureate John C. Polanyi, is sponsored by Canada's Natural Sciences and Engineering Research Council.

"At Los Alamos we are particularly proud to be a part of the SNO experiment and its important discovery. We have built a dedicated team at the Lab and collaborated for more than a decade with some of the best scientists in the world on this difficult project," said Andrew Hime, Los Alamos principal investigator on SNO. "This is a tribute to the Laboratory for its keen interest to pursue the most cutting

edge problems in modern science, akin to the pioneering days of Fermi and Cowan who, 50 years ago, heard the detection of the neutrino for the first time. This great tradition in science at Los Alamos will continue, including new efforts to elucidate fundamental properties of the neutrino and to identify the mysterious dark matter in the

universe."

The sun and other stars constantly emit neutrinos, tiny subatomic particles that infiltrate the universe, by fusing hydrogen into helium. But neutrinos are extremely difficult to detect because they can pass through most forms of matter easily.

Scientists calculate that approximately 3 million neutrinos pass through every square centimeter of Earth's surface every second, but only 3 to 10 billion ever interacts with other matter. In fact, billions of neutrinos pass through the human body every second with no noticeable effect, and it would take a block of lead one light

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year thick (about 10,000,000,000,000 kilometers) to stop even half of any neutrino stream. SNO researchers have found ways, however, to overcome such barriers to provide groundbreaking insight into these ghostly particles.

"This award recognizes the excellent work by a great international team of scientists and dedicated laboratory staff members," said SNO Director Art McDonald.

SNO's success lies in the $100 million neutrino detector housed in the world's deepest underground laboratory at Inco Ltd.'s Creighton nickel mine near Sudbury, Ontario. The heart of this detector is a 10

story cavern

the home of the world's largest acrylic vessel, holding 1,000 tons of heavy water. The heavy water in the SNO detector allows the detection of neutrinos on the rare occurrences when they crash directly into an electron or a nucleus of an atom in a heavy

water molecule. The reflections emit small pulses of light, which are captured by 9,600 photomultiplier tubes that surround the heavy

water vessel. False signals from cosmic rays and other radiation are kept to a minimum by the 2 kilometers of rock above and an obstacle for cleanliness at this unique underground facility.

Since its conception during the early 1990s, Los Alamos researchers have contributed to every aspect of the SNO experiment, including detector construction and commissioning. They helped develop a complex program to calibrate and understand the response of the detector to elusive neutrinos as well as radioactive backgrounds, participated in the analysis and publication of the scientific results expected from the experiment, and were active in the overall scientific management of the project. The detector is presently operating in its final phase, utilizing a novel detector m

Overall, the SNO team gained international recognition by proving that neutrinos released in the core of the sun change their "flavor," or type, as they travel to Earth. About two

-thirds of them change into two other types of neutrinos, not visible to earlier detectors used at other laboratories.

Finding these "missing" neutrinos solved a 30-year-

old scientific problem: the discrepancy between the number of neutrinos observed and the previous predictions of theoretical models explaining how the Sun shines. The SNO measurements also proved that the most basic laws of physics are incomplete. Such data has led to a more complete description of nature at the subatomic level.

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