Capturing Elusive, Ghostly Particles

Hamish Robertson

Boeing Distinguished Professor, Physics

CURRENT RESEARCH

Experiments to measure the mass of neutrinos

Physics is largely built on theories, principles, and standard models that encompass laws of nature. Neutrinos, particles so tiny that they are thought to be massless by many, have shaped the entire universe and are fundamental components of physics, but much remains unknown about them. A breakthrough in understanding them therefore may shift the paradigms of current standard models of physics. Dr. Hamish Robertson, Boeing Distinguished Professor of Physics at University of Washington, is working to measure the mass of neutrinos -- a fundamental mystery in particle physics for decades. The fact that neutrinos have mass is the only known contradiction to the standard model of particle physics. Knowing the mass will help in building a new theory of matter. Moreover, neutrinos are the only particles that are able to escape the sun's core into space and take only eight minutes to get to Earth traveling at the speed of light while the sun's energy takes thousands of years to reach our surface and warm us. Therefore, neutrinos from the sun can tell us about energy production in the sun's core, and potentially provide insight into the sun's variability and lead to practical applications in climate change.

The fact that neutrinos can escape the sun so easily means that they are also hard to catch. In order to measure the mass of the neutrino, Dr. Robertson designs very sensitive experiments that catch the electrons that are made at the same time as the neutrinos. In 1988 when many scientists still believed that neutrinos were massless, Dr. Robertson joined a project called the Sudbury Neutrino Observatory (SNO) in Canada and used that detector to show that neutrinos "oscillate", which indicates that they must...

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AFFILIATION

University of Washington

EDUCATION

- Ph.D. in 1971,McMaster University (Canada)
- M.A. in 1969,Oxford University
- B.A. in 1969,Oxford University

AWARDS

- Polanyi Prize awarded to SNO Collaboration, 2006
- National Academy of Sciences, 2004
- Fellow, American Academy of Arts and Sciences, 2003
- American Physical Society Tom W. Bonner Prize, 1997
- Alfred P. Sloan Foundation Fellowship, 1976

RESEARCH AREAS

Technology, Space, Materials Science / Physics

FUNDING REQUEST

Your contributions will support Dr. Hamish Robertson at University of Washington as he conducts sensitive experiments to measure the neutrino mass. Donations will help fund 13 students and researchers, resources like liquid helium and electrical power, and equipment like vacuum pumps, amplifiers, and a large and complex superconducting magnet. The cost of these items range from 1K to $3-4M. Partner with Dr. Robertson to find answers to the most important and pressing questions in particle physics!