Kunio Inoue ／ Professor ／ Graduate School of Science

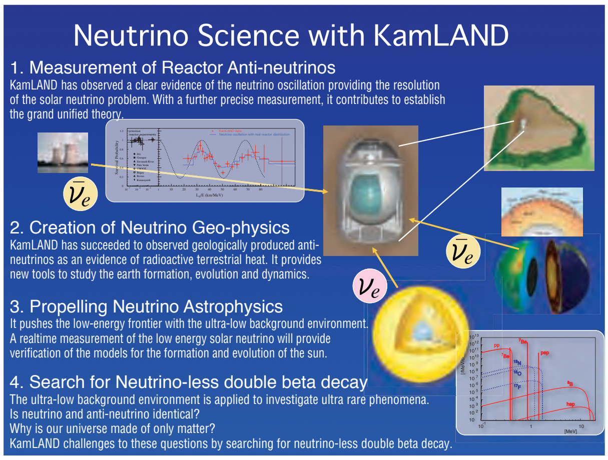
Profile

He started to address the solar neutrino problem in the Graduate School of Science, Osaka University in 1988. He moved to the University of Tokyo in 1990 and joined Kamiokande and continued Super-Kamiokande afterward. He focused on the observation of solar neutrinos. He was appointed research associate of the Institute for Cosmic Ray Research, University of Tokyo, in 1992, and completed his dissertation in Physics in 1994. He was awarded the Asahi prize (1998) for "the discovery of neutrino mass" as a member of the SK group. He moved to RCNS, Tohoku University as an associate professor in the same year for starting the KamLAND experiment. He won the first Koshiba prize (2004) in connection with the resolution of the solar neutrino problem and was promoted to a full professor in the same year. He has been the director of RCNS since 2006 and is propelling neutrino geophysics and astrophysics with KamLAND. He has also been contributing to nurture young talents as a leader of the global COE program "Weaving the Science Web beyond the Particle Matter Hierarchy" since 2008.

Research Activities

One of the matter particles, "neutrino" is a neutral and very light particle, and it exists in many orders of magnitude more abundant than any others in the universe. Unveiling neutrino properties is connected with understanding our universe and establishing the grand-unified theory of elementary particles. Neutrinos scarcely interact with matter and are hardly detected. KamLAND, holding 1000 tons of liquid scintillator at 1000 meters underground, observes those elusive neutrinos. It has found that anti-neutrinos from nuclear power reactors continually vanish and reappear. This clear evidence of neutrino oscillation resulted in the resolution of the solar neutrino problem, which concerns why neutrino flux from solar fusion reaction is significantly smaller than that expected from solar luminosity. Utilizing the elusiveness of neutrinos for looking into opaque objects, KamLAND has succeeded in observing geologically produced anti-neutrinos and opened a new field of "Neutrino Geophysics." It also applies to a precise observation of the interior of the sun. A neutral matter particle, neutrino, may not distinguish particles and anti-particles. The fact is a key in solving why we born from nothing in the Big Bang are made of just matter. A search for neutrino-less double beta decay directly connects to the resolution. The ultra-low background experiment, KamLAND, accords with the study and vigorous research and development is going on regarding the search.

Inner view of KamLAND taken at the construction. Fifty centimeters diameter photo-sensors are installed inside the 18-m diameter sphere.



Message

I have been focusing on solving the solar neutrino problem in my research career. At the beginning, I committed myself to works far from particle physics such as crystal growth or metal dope in organic liquid for developing a neutrino detector. Then, I became deeply devoted to the observation of solar neutrinos with Kamiokande and Super-Kamiokande, looking for smoking-gun evidence of neutrino oscillation as a solution for the solar neutrino problem. But no evidence was found. I began to think the resolution could be my lifework. All of a sudden, the solar neutrino problem was solved by taking a different approach, the measurement of reactor anti-neutrinos with KamLAND. The construction of KamLAND was my fourth experience of photo-multiplier-tube installation. I'm quite skilled in this heavy physical task. It also required continual cleaning work for four months, in order to have the world cleanest detector. I learned what is indispensable for opening a new frontier is to pursue unpleasant work and to have a wide view. Neutrino observation with KamLAND is expected to apply to other fields, such as neutrino geophysics and astrophysics. Investigating new possibilities is really interesting, and I'm willing to share such fascinating experience with students. I'm leading the global COE program in order to achieve this. I'm anticipating collaboration with many more students who will strengthen the scientific base of Japan.