



## **Robert C. Richardson**

June 26, 1937 – February 19, 2013

Robert (Bob) Richardson was born on June 26, 1937 in Washington, DC. He grew up in the Washington suburb of Arlington, Va. He attended the Arlington County public schools and graduated from Washington-Lee High School in 1954. He was very active in the Boy Scouts. He became an Eagle Scout and especially enjoyed the outdoor activities of scouting - hiking, camping, and bird watching. He attended Virginia Polytechnic Institute between 1954 and 1960 where he obtained both B.S. and M.S. degrees in physics. After a brief time in the United States Army he returned to graduate school in physics at Duke University. His thesis work involved NMR studies of solid  $^3\text{He}$ . He obtained his Ph.D. degree from Duke in 1966. His thesis advisor was Professor Horst Meyer.

In the Fall of 1966 he began work at Cornell University in the laboratory of David Lee. Their research goal was to observe the nuclear magnetic phase transition in solid  $^3\text{He}$  which could be predicted from Richardson's thesis work with Horst Meyer at Duke. In collaboration with Douglas Osheroff, a student who joined the group in 1967, they worked on cooling techniques and NMR instrumentation for studying low temperature helium liquids and solids. In the Fall of 1971, they made the accidental discovery that liquid  $^3\text{He}$  undergoes a pairing transition similar to that of superconductors. In the case of superconductivity, the electrons flow through a metal without electrical resistance. In the newly discovered phases of the  $^3\text{He}$ , the helium atoms carried no electrical charge but could flow without resistance – thus the liquid is a superfluid. The onset of superfluidity was observed at .0027 Kelvin degrees above absolute zero. Although  $^3\text{He}$  atoms are not charged, their nuclei are very weak magnets. In each of the pairs of  $^3\text{He}$  atoms in superfluid  $^3\text{He}$ , these weak nuclear magnets are aligned parallel to one another, giving a net magnetism. Thus the use of nuclear magnetic resonance played an important role in the discovery. In fact, the Cornell work was the very first use of magnetic resonance imaging (MRI) in a physics experiment. Osheroff, Richardson and Lee were awarded the 1996 Nobel Prize in Physics as well as the 1976 Sir Francis Simon Memorial Prize of the British Institute of Physics (IOP) and the American Physical Society's 1981 Oliver Buckley Prize in Condensed Matter Physics, for their discovery of superfluid  $^3\text{He}$ . The issue of the magnetic phase transition in solid

$^3\text{He}$  was finally settled in later experiments by Bob Richardson along with his graduate student William Halperin and also Charles Archie, Finn Rasmussen and Robert Buhrman. After follow up experiments on superfluid  $^3\text{He}$ , Bob and his students performed a series of experiments on cross relaxation of the nuclear magnetism in liquid  $^3\text{He}$  and the nuclear magnetism of fluorine atoms in tiny fluorocarbon beads. He then spear-headed an effort to construct a microkelvin facility to achieve even lower temperatures which was completed in 1986 to study electrical and magnetic properties of various solids.

Bob's career at Cornell spanned five decades beginning as a research associate in 1966, a professor in 1968, full professor in 1975, the Floyd R. Newman Professor of Physics in 1987, Director of Cornell's Laboratory of Atomic and Solid State Physics from 1990 to 1996, Senior Vice Provost for Research from 1998 to 2007, Founding Director of the Kavli Institute at Cornell for Nanoscale Science from 2004 to 2009, Senior Science Advisor to the President and Provost from 2007 to 2009, and Senior Vice Provost for Research, Emeritus, in 2008.

Bob was the recipient of numerous awards and distinguished fellowships. He was a member of the National Academy of Science, the American Academy of Arts and Sciences and the American Philosophical Society. He served on several national boards that worked to advance research and higher education policy. Bob also served as a member of the National Research Council Committee on Prospering in the Global Economy of the 21st Century from 2005 to 2007, which produced the vital report "Rising Above the Gathering Storm."

Of his many accomplishments, Bob often highlighted his 30 years of teaching college physics. In 1985 he prepared a series of video taped lectures for Physics 101 and 102, the course for biology students. Bob was also noted for giving popular lectures involving demonstrations of low temperature phenomena. Finally, along with his wife Betty and Alan Giambattista (both senior lecturers at Cornell), Bob was a coauthor of a popular elementary physics text "College Physics" (McGraw-Hill 2004).

*Robert Buhrman, David Lee, John Reppy*