2010

4th Annual Dasari Lecture
John Thomas, Duke University
"A Tale of Quantum Viscosity in Universal Fermi Gases"

John Thomas has a longstanding, close association with MIT and the Harrison Spectroscopy Laboratory. He earned a BS in physics at MIT in 1973, writing a senior thesis under the supervision of Ali Javan. He then did graduate work with Javan and received his PhD degree in 1979. Then Thomas continued on for brief periods as a post-doc at MIT and then as an assistant professor (Aeronautics and Astronautics). He was a research scientist at the Spectroscopy Laboratory for about five years during which time he made important contributions in several areas including photon echoes, radiator reorientation collision kernels and laser induced nuclear orientation studies.

As director of the Quantum Optics Laboratory at Duke, John Thomas leads explorations of the physics of an optically trapped atomic Fermi gas. His group has developed techniques for all-optical trapping and cooling, and their ultra-stable, all-optical traps for neutral atoms have achieved trap lifetimes of more than 400 seconds comparable to the best magnetic traps. By direct evaporative cooling of neutral atoms in optical traps, Thomas's group achieved the first all optical production of a degenerate Fenni gas and in 2002, by tuning across the Feshbach resonance of lithium-6 atoms, became the first to produce and study a strongly interacting degenerate Fermi gas. Because this system exhibits universal behavior, it can be used to test nonperturbative methods of many-body calculations in disciplines from nuclear matter to high temperature superconductors. In 2004 the Duke group was the first to observe evidence for high temperature superfluid hydrodynamics in a strongly interacting Fermi gas. Ongoing experiments include studies of the thermodynamics and mechanical properties of this unique quantum system.