AUSTRALIAN INSTITUTE OF PHYSICS
TASMANIAN BRANCH

UTAS
School of
Mathematics and Physics

Winter Public Lecture Series in Physics
in honour of Alexander and Leicester McAulay

Courtesy of the University of British Columbia

Superconductivity: the first 100 years

Dr John Macfarlane

CSIRO (Retired Fellow)

Thursday, 14 July 2011, 8 PM

Physics Lecture Theatre 1, Sandy Bay Campus, University of Tasmania

ABSTRACT:

In 1911, a strange and perplexing quirk of Nature was discovered in Leiden, Holland, by the physicist Heike Kamerlingh Onnes. Using the ultra-low temperatures which he had successfully produced through the liquefaction of helium (in itself a formidable task), he had started to measure the electrical properties of the then-known elements as they were cooled near to the absolute zero. He was astonished to discover that in the case of mercury, the electrical resistance seemed to vanish altogether. The measurements (which were actually carried out by Onnes' assistant Gilles Holst) opened up a new aspect of Nature which was completely surprising, and was not fully understood by the theorists for at least another 40 years.
Since 1911, many new materials and many other surprising aspects of superconductivity have been revealed, mainly by experimentalists, leading up to the so-called "High Temperature Superconductors" which were announced in several technical breakthroughs, starting in 1987, by Georg Bednorz and Alex. Muller in Switzerland.
In recent years, the more subtle " Quantum" aspects of superconductivity have yielded a rich harvest of new phenomena, for theorists and experimentalists alike, and are not yet fully understood. In the lecture I will attempt to demonstrate some of the traditional effects such as the disappearance of resistance, the levitation of a magnet, and the exclusion of magnetic fields. Applications of these properties in geophysical exploration, medical imaging, and measurement standards will also be discussed. The level of the presentation will be aimed at senior students and the general public.

SPEAKER PROFILE:

John Macfarlane graduated with B. Sc. (Hons.) in Natural Philosophy from the University of Glasgow in 1958 and then spent two years as a Health Physicist with the UK Atomic Energy Authority. He carried out research at the University of Strathclyde on thin-film dielectrics, which led to the award of his PhD. In 1964, John joined CSIRO, Sydney, as a Research Scientist, where he was subsequently appointed Project Leader, Superconducting Devices. After spending a further few years in UK (at Strathclyde and at the National Physical Laboratory), he moved to Tasmania in 2009 where he now lives near his extended family. He still maintains contact with CSIRO as an Honorary Research Fellow (Retired).

This is the second lecture in this year's Winter Public Lecture Series in Physics. The series started in 2002 and is held in honour of Alexander and Leicester McAulay, two renowned Physics professors, who were inspiring teachers and did significant research at the University of Tasmania during the early years.

ALL WELCOME