भौतिक अनुसंधान प्रयोगशाला, अहमदाबाद

Physical Research Laboratory, Ahmedabad

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65_PRL Ka Amrut Vyakhyaan

Wednesday, 26 October 2022

@ 05:00 PM (IST)

"What Can We Do With a Quantum Liquid?"

Prof. Anthony J. Leggett (Nobel Laureate)

University of Illinois at Urbana-Champaign.

https://youtu.be/sA8iTCXsPzU

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Abstract

In this "Amrut Vayakhayan" we will present an elementary account of the behaviour of gases and liquids at very low temperatures where counter-intuitive quantum mechanical effects are important. The constituent particles exhibit wave like properties, and below a certain critical temperature they transition into a very special state of matter called quantum condensate which shows macroscopic quantum behaviour. Recent developments in this field will be surveyed.

The Speaker

Sir Anthony James Leggett KBE, FRS (born 26 March 1938) is a British-American theoretical physicist and professor emeritus at the University of Illinois at Urbana-Champaign. Leggett is widely recognised as a world leader in the theory of low-temperature physics. He was awarded the 2003 Nobel Prize in Physics along with V. L. Ginzburg and A. A. Abrikosov for pioneering contributions to the theory of superconductors and superfluids.

He has shaped the theoretical understanding of normal and superfluid helium liquids and strongly coupled superfluids. He set directions for research in the quantum physics of macroscopic dissipative systems and use of condensed systems to test the foundations of quantum mechanics. His research focuses on cuprate superconductivity, superfluidity in highly degenerate atomic gases, low temperature properties of amorphous solids, conceptual issues in the formulation of quantum mechanics and topological quantum computation.

Prof. Leggett is a member of the National Academy of Sciences, the American Philosophical Society, the American Academy of Arts and Sciences, the Russian Academy of Sciences (foreign member), the Indian National Science Academy, and was elected a Fellow of the Royal Society (FRS) in 1980, the American Physical Society, and American Institute of Physics, and Life Fellow of the Institute of Physics.

He is an Honorary Fellow of the Institute of Physics (UK). He was appointed Knight Commander of the Order of the British Empire (KBE) in the 2004 Queen's Birthday Honours "for services to physics". He also won the 2002/2003 Wolf Foundation Prize for research on condensed forms of matter (with B. I. Halperin). He was also honoured with the Eugene Feenberg Memorial Medal (1999). He has been elected as a Foreign Fellow of the Indian National Science Academy (2011).

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About PRL

The Physical Research Laboratory (PRL), known as the “cradle of space science” in India, is one of the premier research institutes founded in 1947 by Prof. Vikram Sarabhai, a renowned Cosmic Ray Scientist, a great visionary and institution builder. PRL played a seminal role in producing a highly motivated cadre of space scientists and the technologists of highest international repute. The first scientific rocket launched from Thumba on 21st November-1963 and many other rockets launched thereafter contained payloads developed at PRL. Dr. Sarabhai initiated many of these scientific and technical activities at PRL which eventually led to the formation of the Indian Space Research Organization (ISRO). Therefore, PRL is known as the “cradle of space science” in India. Further, the research in the area of Plasma Physics expanded to the formation of the Institute of Plasma Research (IPR).

As an institution PRL is unique in that it conducts fundamental research in a wide range of research areas from the Earth to the cosmos, and comprising Astronomy and Astrophysics; Solar Physics; Space and Atmospheric Sciences; Theoretical Physics; Geosciences; Atomic, Molecular and Optical Physics, Astrochemistry; and Planetary Sciences and Space Exploration. PRL is one of the rare research institutes of international repute wherein research in such diverse fields of sciences is carried out using several state-of-the-art experimental facilities that exist under one umbrella.

Along with the ongoing research, several new initiatives have been taken up during the last few years. The Multi-Application Solar Telescope (MAST) at Udaipur Solar Observatory has been operationalized. PRL initiated scientific programmes in frontier areas of research, which include a search for exo-planets, laboratory studies of interstellar grains, laboratory synthesis of cold astromolecules and experimental studies in the field of quantum optics. PRL is also developing several scientific payloads as a part of ISRO’s larger vision and contributing to roadmap for competitive scientific exploration of the solar system and beyond. In particular, PRL has been contributing significantly not only in building instruments for space missions, such as Chandrayaan-1, Chandrayaan-2, AstroSat and upcoming Aditya-L1, Chandrayaan-3 and planetary and space missions, but also by bringing out new and insightful science results.

PRL contributes to several national and international research programmes and to human resource development through its Doctoral and Post-Doctoral Programmes, capacity building programmes, such as UN Course on Space Science, and science and engineering internship programmes. PRL contributes significantly to society through its Outreach Programmes by periodically organizing science exhibitions and Open Houses, planned visits of students of various school and college to PRL, and popular talks at various institutions to not only share the excitements of the advancements of contemporary scientific findings but also to encourage students to take up sciences as their research career.

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