



Physical Research Laboratory, Ahmedabad

Colloquium 16-06

Speaker: Prof. Subir Sachdev,
Department of Physics, Harvard university

Title: “Quantum entanglement and the phases of matter”

Time: Wednesday, 13 April 2016, 16.00 hrs.

Venue: K. R. Ramanathan Auditorium, PRL

Abstract

Most the familiar phases of electronic matter have been understood in terms of the quantum theory of independent electrons moving in a crystal: this includes most metals, insulators, semiconductors, and superconductors. However, a number of modern materials require understanding of phases with long-range quantum entanglement between the electrons. This is especially so for certain quantum “critical” states: these turn out to have a holographic connection to the dynamics near the horizon of a charged black hole. I will describe recent experimental observations on graphene, and on the copper-based high temperature superconductors, and interpret the results using theories of quantum criticality.

The Speaker

Prof. Subir Sachdev is the Herchel Smith Professor of Physics at Harvard University. He is well known for his research on quantum phase transitions and its application to a variety of quantum materials, such as the high temperature superconductors. His research seeks to illuminate the boundary between the everyday world we live in - in which many but not all phenomena can be explained through classical physics - and the subatomic world of quantum physics. These two worlds come together at a ‘quantum phase transition’, where there is a change in the macroscopic character of the quantum state describing a many-particle system, and manifestations of quantum entanglement appear naturally at long distances. His book Quantum Phase Transitions (Cambridge University Press, 1999 and 2011) has formed the basis of much subsequent research. More recently he has developed the remarkable connection between the nature of quantum entanglement near the horizons of black holes, and the entanglement in quantum materials. Prof. Sachdev is a member of the US National Academy of Sciences and has been awarded several honors, among them the Dirac Medal in 2015, the Lorentz Chair in 2012, and the Salam Distinguished Lecturer in 2014.

High Tea at 15:30 hrs.

ALL ARE WELCOME

