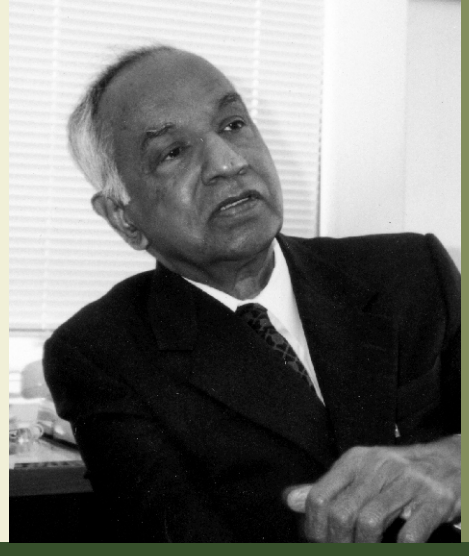
ICTS | INTERNATIONAL CENTRE for THEORETICAL SCIENCES, TIFR



SUBRAMANYAN CHANDRASEKHAR LECTURES

SUBIR SACHDEV is Professor of Physics at Harvard University. He also holds a Distinguished Research Chair at the Perimeter Institute for Theoretical Physics. He obtained his Ph.D. from Harvard in 1985. He was a Guggenheim Foundation fellow, and received the Apker Award from the American Physical Society. His research has focused on a variety of quantum materials, and especially on their quantum phase transitions. He was an early proponent of using ideas based on quantum criticality to describe the phase diagram of the cuprate superconductors. He is the author of the book Quantum Phase Transitions (Cambridge University Press,1999). In recent years, he has applied the AdS/CFT correspondence to describe strongly interacting phases of quantum matter.

Subramanyan Chandrasekhar lectures are delivered by eminent academicians on important new developments in their areas of specialty. The first lecture in any series is aimed at a general scientific audience, while the remaining are aimed at specialists.

SUBIR SACHDEV

Harvard University

THE QUANTUM PHASES OF MATTER

Quantum mechanics was developed in the early twentieth century to describe the motion of a single electron in a hydrogen atom. Later, Einstein and others pointed out that the quantum theory of a pair of electrons had non-intuitive features which they found unpalatable: two well-separated electrons can have their quantum states "entangled", indicating that they talk to each other quantum mechanically, even though they are far apart. Today, quantum entanglement is not viewed as a subtle microscopic effect of interest only to a few physicists, but as a crucial ingredient necessary for a complete understanding of the many phases of matter. A crystal can have roughly trillion trillion electrons entangled with each other, and the different patterns of entanglement lead to phases which are magnets, metals, or superconductors. I will give a simple discussion of these and other remarkable features of the quantum mechanics of a trillion trillion electrons, and of their importance to a variety of technologically important materials. The theory also has surprising and unexpected connections to string theory: remarkably, this connects the motion of electrons within a plane of a crystal in the laboratory, to the theory of astrophysical black holes similar to those studied by Chandrasekhar.

CO ORGANIZED BY
INDIAN INSTITUTE OF SCIENCE, BANGALORE

6 Dec 2010 at 4 pm in Faculty Hall, IISc, Bengaluru
7 Dec 2010 at 4 pm in Faculty Hall, IISc, Bengaluru
8 Dec 2010 at 4 pm in Faculty Hall, IISc, Bengaluru

ICTS Office, A-321, Tata Institute of Fundamental Research, Colaba, Mumbai 400005, India
E-mail: icts@theory.tifr.res.in Tel: +91 22 2278 2287 Fax: +91 22 2280 4731 Web: www.icts.res.in