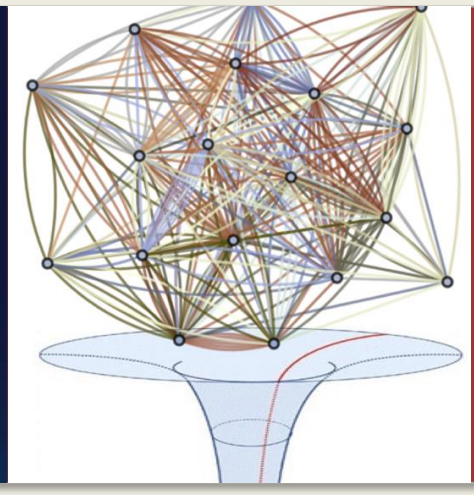
TATA INSTITUTE OF FUNDAMENTAL RESEARCH

13th Homi Bhabha Public Lecture by Subir Sachdev

Quantum entanglement, strange metals and black holes

Image credit: Scientific American



Subir Sachdev *is Herchel Smith Professor of Physics at Harvard University. A Ph.D. in theoretical physics, he attended the Indian Institute of Technology, Delhi, the Massachusetts Institute of Technology and Harvard University. He also holds the Dr. Homi J. Bhabha Chair Professorship at TIFR and is a member of the U. S. National Academy of Sciences. He has been awarded the Dirac Medal in 2015, the Lorentz Chair in 2012, and the Salam Distinguished Lecturer in 2014.*

Einstein apparently called it "spooky action at a distance." Entanglement is a counterintuitive feature of quantum theory by which two particles can be correlated even when separated by vast distances, such that a measurement of one particle instantaneously determines the state of another. Remarkably, quantum entanglement can also happen *en masse*, and determines observables properties of macroscopic objects.

In this lecture, Dr. Sachdev will present a simple model of many-particle entanglement, which has led to new insights into two very different classes of systems. First, we have crystals of materials containing layered arrangements of copper and oxygen atoms. At low temperatures these materials exhibit superconductivity, the ability to conduct electricity without resistance. But at higher temperatures they exhibit a "strange metal", which conducts electricity and heat in a novel manner linked to the collective quantum entanglement of the electrons. Second, we have black holes, astrophysical objects so dense that even light cannot escape past a horizon. Hawking argued that quantum entanglement can be present across the horizon, and this leads to radiation from the black hole. Remarkably, the simple model of entanglement leads to a common description of the physical properties of both classes of systems.

Tuesday – January 17, 2017 at 5 p.m.

Homi Bhabha Auditorium, TIFR

1-Homi Bhabha Road, Colaba, Mumbai 400005

For details:22782500, 22782089, pro@tifr.res.in **Talk is open to all. Non TIFR members are requested to carry valid photo ID.**