



PHYSICS
COLORADO STATE UNIVERSITY



CSU PHYSICS COLLOQUIUM

Resistance is Futile: High temperature and topological superconductivity

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March 25th at 4 p.m.

120 Engineering (Hammond Auditorium)

Abstract

Superconductivity, or a true zero-resistance state, is known to originate from the creation of Cooper pairs of electrons that can condense into a phase-coherent macroscopic quantum state. The physics behind the creation of this state as well as the new physics this state can enable are beautiful, exotic, and deeply rooted in the magic of quantum mechanics.

I will discuss recent experiments utilizing Einstein's photoelectric effect (greatly improved since his days) that allow us to directly probe the nature of the Cooper pairs and the electronic interactions that give rise to these pairs in two important classes of superconductors: a) cuprate superconductors with very high transition temperatures $T_c \sim 100\text{K}$ in which the pairing interactions are still unknown, and b) the electron-phonon superconductor MgB_2 with $T_c=39\text{K}$ that we show could combine the wave-function twists of topological physics with the electron-hole symmetry of superconductivity to create a topological superconductor – a special type of superconductor that may enable new classes of quantum computation.

