3:30 pm • Friday May 9, 2014 • 2241 Chamberlin Hall • Coffee at 4:30 pm

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"Phun" with Photoelectrons or
What Sets the T_c in Cuprate High-Temperature Superconductors?

Department of Physics Colloquium

WISCONSIN

Angle-resolved photoemission spectroscopy (ARPES) has recently emerged as one of the most powerful probes of the electronic structure of a solid, directly giving the detailed energy-momentum dispersion relations (band structures), Fermi surfaces, etc. – properties that are the starting point for almost all analyses of the physical properties of a solid. Going more deeply, ARPES also has unique abilities to uncover the dynamical interaction effects or "self energies" that dominate the physical properties of correlated electron materials.

Perhaps the most famous and exotic of correlated electron materials are high-temperature cuprate superconductors, which have exotic "normal" and superconducting states, neither of which are understood. Here I show our latest results on this problem, focusing not just on the pairing energy scale (the gap Δ) but also the pair-breaking energy scale Γ. In contrast to conventional superconductors in which the superconducting transition temperature T_c is set by the pairing energy alone, I show that T_c in the cuprates is set by a crossover between the pairing and pair-breaking energy scales, each of which is strongly temperature-dependent. I then discuss how this is likely related to the strong interactions present in the normal state, with many of these interactions "undressing" as the material goes superconducting.

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