Fall 2015 Joint Colloquium
Materials Department & Materials Research Laboratory

Dr. Nicholas Breznay
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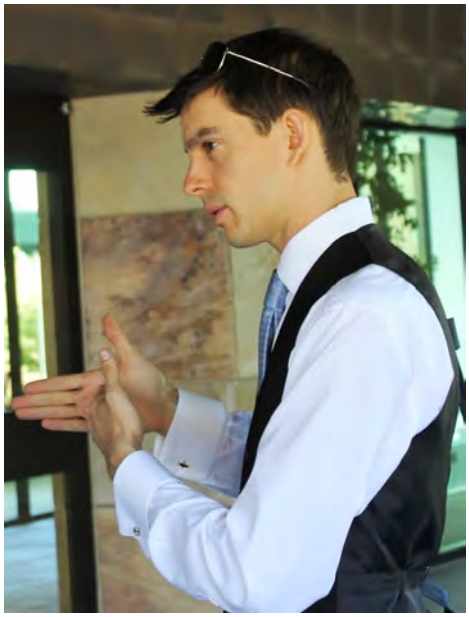
UC Berkeley



Friday, November 6th, 2015
11:00 am, Elings 1601

Pizza served afterwards.

Mapping the Fermi surface of new materials using magnetic quantum oscillations

Quantum oscillations are an unambiguous signature of a material's Fermi surface, which in turn is the defining characteristic of a metal. For sufficiently clean materials the electronic density of states becomes an oscillatory function of the magnetic field B, and quantities sensitive to the density of states (such as electrical conductivity) exhibit oscillations periodic in 1/B. These oscillations can be difficult to resolve in complex materials (such as transition metal oxides) due to disorder effects, which broaden the Landau levels until they are indistinguishable in laboratory scale magnetic fields. Their observation therefore serves as an "acid test" for materials quality, as well as a precise technique for determining the number, sign, and effective mass of charge carriers. In this talk, I will explain how intense magnetic fields can be used to investigate the size and topology of metallic Fermi surfaces. As an example, I will describe recent observations of Shubnikov-de Haas quantum oscillations in MBE-grown thin films of the cuprate high-Tc superconductor $PrCuO_4$. Our results are consistent with the presence of small hole-like Fermi surface pockets, and a large effective mass enhancement near the suppression of superconductivity.

BIO Nicholas P. Breznay joined the University of California, Berkeley as a postdoctoral fellow in 2015. He received his B.S. in physics from Harvey Mudd College, and his Ph.D. in applied physics from Stanford University in 2013. At Stanford, he worked with Aharon Kapitulnik on experimental studies of disordered superconductors, fluctuation phenomena, and quantum phase transitions. Following his graduate studies, he began as a postdoctoral fellow in the Analytis Research Group at Lawrence Berkeley National Lab in 2013, where he has focused on iridium-oxide magnetic materials and high-magnetic-field transport experiments in thin film cuprates. He is also interested in crystalline and amorphous phase-change materials such as $GeSb_2Te_4$, as part of an ongoing collaboration with RWTH Aachen University.

http://research.physics.berkeley.edu/analytis/

Hosted by Susanne Stemmer