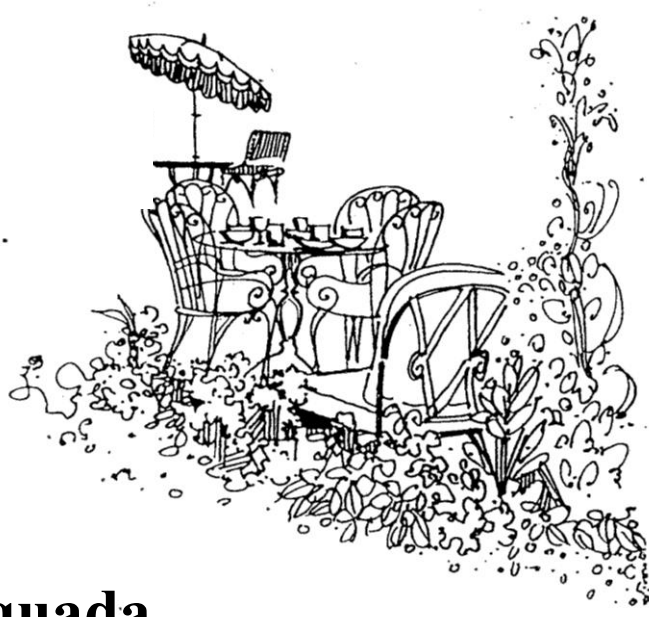
Chez Pierre

Presents ...

Monday, March 12, 2012
12:00pm
MIT Room 4-331



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"Superconductivity and Stripes in $La_{2-x}Ba_xCuO_4$"

In hole-doped cuprates, superconductivity occurs where antiferromagnetic ordering and charge carrier mobility are mutually frustrated. A contentious question has been: what sorts of correlations emerge to reduce the frustration and how do they relate to the superconductivity? In the system $La_{2-x}Ba_xCuO_4$, we observe the formation of charge and spin stripes that order when a structural transition leads to suitable anisotropy of the CuO_2 planes [1]. At x=1/8, where stripe ordering is strongest, bulk superconductivity is suppressed; nevertheless, evidence for 2D superconductivity is observed [2]. This is an intriguing situation, as the coexistence of locally antiferromagnetic order with superconductivity appears to require an intertwining of the order parameters [3]. At x=0.095, we observe robust superconductivity below 32 K [4]; however, the spin fluctuations are essentially gapless, with no obvious magnetic resonance below T_c. This may require a spatial modulation of the pair wave function. These experiments provide valuable insights into the intimate relationships among spins, charges, and pairing in the cuprates.

1. M. Hücker *et al.*, Phys. Rev. B **83**, 104506 (2011).
2. Q. Li *et al.*, Phys. Rev. Lett. **99**, 067001 (2007); J.M. Tranquada *et al.*, Phys. Rev. B **78**, 174529 (2008).
3. E. Berg *et al.*, New J. Phys. **11**, 115004 (2009).
4. J.S. Wen *et al.*, arXiv:1009.0031; arXiv:1111.5383