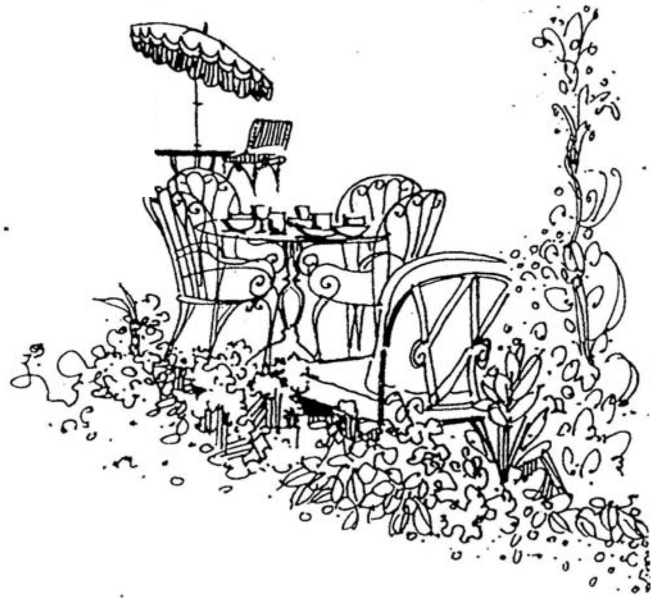
Chez Pierre

Presents ...

Monday, October 20, 2008

12:00pm

MIT Room 4-331



Ravin Bhatt

Princeton University

"Search for ferromagnetism in doped semiconductors without magnetic ions"

Ferromagnetism has been observed in diluted magnetic semiconductors containing transition metal ions at temperatures in excess of 100K (e.g. in Ga1-xMnxAs). By contrast, conventional doped semiconductors with shallow dopants have shown no tendency towards ferromagnetism, either for uncompensated or compensated systems. This is despite the fact that the Hubbard model, which is often used to capture the physics of impurity bands at low densities, is believed to have a ferromagnetic ground state in the low density (large U/t) limit away from half filling. A reexamination reveals that modeling semiconductors doped with "non-magnetic ions" requires a modification of the Hubbard model. As a result, they do exhibit significant ferromagnetic tendencies at nanoscales, in a region of parameter space ***not*** accessible to bulk systems, but achievable in quantum dots and heterostructures. Implications for studying these effects in experimentally realizable systems, as well as the possibility of ferromagnetism at longer length scales in these systems will be discussed.