Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

**Antiferromagnetic to singlet transition in the quarter-filled band**
R.T. CLAY, Mississippi State University, S. MAZUMDAR, University of Arizona —
One of the greatest challenges in constructing a theory of superconductivity in the presence of strong electron-electron (e-e) interactions is to describe how a transition can occur from antiferromagnetic to singlet order. Transitions between antiferromagnetism (AFM) and singlet order are well known in several specific cases such as the spin-Peierls (SP) transition, dimerization in the presence of antiferromagnetic nearest neighbor and second neighbor couplings, and the rung-based singlet in the rectangular spin ladder. In all three examples, the transition is a consequence of confinement within a quasi-one-dimensional lattice. Similar AFM/singlet transitions have not been found in the two dimensional (2D) 1/2-filled band. We present evidence that an AFM/singlet transition can occur in a 2D 1/4-filled anisotropic triangular lattice. A key difference is that at 1/4 filling, inhomogeneity in the form of coexisting charge, bond, and spin orders occur due to e-e and electron-phonon interactions. We show that with increasing lattice frustration the ground state of the 1/4-filled band anisotropic triangular lattice changes from AFM to a charge-ordered state with local singlets. Our results have direct implications for the 1/4-filled organic superconductors as well as related inorganic materials such as $Na_xCoO_2$, $LiTi_2O_4$, $CuRh_2S_4$. Supported by DOE grant DE-FG02-06ER46315.

R. T. Clay
Mississippi State University

Date submitted: 22 Nov 2008 Electronic form version 1.4