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Two routes to disorder-induced magnetism and nematicity in the cuprates BRIAN M. ANDERSEN, Niels Bohr Institute, University of Copenhagen, PETER J. HIRSCHFELD, University of Florida, RASMUS B. CHRISTENSEN, Niels Bohr Institute, University of Copenhagen, SIEGFRIED GRASER, Augsburg University — We study disorder-induced magnetism within the Gutzwiller approximation applied to the t-J model relevant for cuprate superconductors. We identify two distinct disorder-induced magnetic phases depending on the strength of the scatterers. For weak potential scatterers, charge reorganization may push local regions in-between the impurities across the magnetic phase boundary, whereas for strong scatterers a local static magnetic moment is formed around each impurity. We calculate the density of states and find a universal low-energy behavior independent of both disorder and magnetization. However, the magnetic regions are characterized by larger (reduced) superconducting gap (coherence peaks) [1]. Recent studies have highlighted the role of a electronic nematic liquid underdoped cuprates. We calculate the spin susceptibility with a small explicitly broken rotational symmetry to show how the induced spin response asymmetry is enhanced by correlations. In the disorder-induced stripe phase, impurities become spin nematogens with a C2 symmetric impurity resonance state, and the disorder-averaged spin susceptibility remains only C2 symmetric at low energies, similar to recent data from neutron scattering on underdoped YBCO [2].

[1] R. B. Christensen et al., accepted Phys. Rev. B (2011).
[2] B. M. Andersen et al., submitted to EPL (2011).

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