Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

**Charge-patterning phase transition on a surface lattice of titratable sites adjacent to an electrolyte solution**[1] JOEL SHORE, GEORGE THURSTON, Rochester Institute of Technology — We discuss a model for a charge-patterning phase transition on a two-dimensional square lattice of titratable sites, here regarded as protonation sites, placed on a square lattice in a dielectric medium just below the planar interface between this medium and an aqueous salt solution. Within Debye-Huckel theory, the analytical form of the electrostatic repulsion between protonated sites exhibits an approximate inverse cubic power-law decrease beyond short distances. The problem can thus be mapped onto the two-dimensional antiferromagnetic Ising model with this longer-range interaction, which we study with Monte Carlo simulations. As we increase pH, the occupation probability of a site decreases from 1 at low pH to 0 at high pH. For sufficiently-strong interaction strengths, a phase transition occurs as the occupation probability of 1/2 is approached: the charges arrange themselves into a checkerboard pattern. This ordered phase persists over a range of pH until a transition occurs back to a disordered state. This state is the analogue of the Neel state in the antiferromagnetic Ising spin model. More complicated ordered phases are expected for sufficiently strong interactions (with occupation probabilities of 1/4 and 3/4) and if the lattice is triangular rather than square.

[1]This work was supported by NIH EY018249 (GMT).

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Date submitted: 05 Jan 2016 Electronic form version 1.4