Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Evidence for a transcritical bifurcation in the 2D Ising model COLIN B. CLEMENT, ARCHISHMAN RAJU, LORIEN X. HAYDEN, D. ZEB ROCKLIN, CAMERON DUNCAN, JAMES P. SETHNA, Cornell University — We find that the 2D Ising model is at a transcritical bifurcation involving the exchange of stability between two fixed points, similar to the Gaussian and Wilson-Fisher fixed points in 4D. Using perturbative normal-form theory–a method from dynamical systems for analyzing bifurcations–we find the simplest flow equations for the 2D Ising model. From this we predict that the flows of the inverse specific heat undergo a transcritical bifurcation near $D = 2$. This is consistent with the conformal bootstrap method, which hints at the existence of two fixed points for $D < 2$. We bring Onsager's exact solution to its normal form, which has a logarithmic singularity due to a 'resonance' between the temperature and free energy eigenvalues. More broadly, our work seems to imply that such resonances can be understood as bifurcations in measurable quantities.

Colin Clement
Cornell University

Date submitted: 11 Nov 2016 Electronic form version 1.4