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**Metropolis Monte Carlo and Wang-Landau Simulations of Tricriticality in Crossed Ising Chains** TYLER CARY, RICHARD SCALETTAR, RAJIV SINGH, University of California, Davis — We explore the phase diagram of Ising spins on one-dimensional chains which criss-cross in two perpendicular directions and which are connected by interchain couplings. This system is of interest as a simpler, classical analog of a quantum Hamiltonian which has been proposed as a model of magnetic behavior in $Nb_{12}O_{29}$ and also, conceptually, as a geometry which is intermediate between one and two dimensions. Using mean field theory as well as Metropolis Monte Carlo and Wang-Landau simulations, we locate quantitatively the boundaries of four ordered phases. Each becomes an effective Ising model with unique effective couplings at large interchain coupling. Away from this limit we demonstrate non-trivial critical behavior, including tricritical points which separate first and second order phase transitions. Finally, we find that the crossover of the magnetization critical exponent from the Ising to tricritical Ising value shows an unusual non-monotonic behavior.

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