Abstract Submitted
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Controlling disordered materials from the boundaries[1] A. ALAN MIDDLETON, SEAN SWEENEY, Syracuse University — We study general models of materials with frozen disorder, such as spin glasses or solids with heterogeneities, and ask how domain walls or optimal fracture surfaces can be controlled by selection of the boundary conditions on the surface of a given sample. We have developed and applied algorithms for optimal ground states that can explore all possible sets of boundary conditions (e.g., the boundary conditions for a disordered Ising model on a square lattice with sides L, with sizes up to $L = 2048$) and thereby rapidly determine all possible paths for domain walls for certain two-dimensional models. We apply this algorithm to uncorrelated and power-law correlated disorder. While this computation has implications for the uniqueness of the ground state in disordered magnetic materials, it fits within a broader set of questions on the sensitivity of the interior of disordered material, as might be seen in the force chains in a given granular packing, when one considers all possible boundary conditions. Interior regions that are shielded by disorder from boundary effects then act as rigid sets of degrees of freedom.

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A. Alan Middleton
Syracuse University

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