Title: **Topological frustration of artificial spin ice**

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Supplemental movie 1 | **Relaxation process to define lithography patterns for direct control of topological defects.** We start with a perfect square lattice, remove a chain of nodes starting at the dislocation point, and then let the system relax. Each bond acts as a spring working to be the same length as the other bonds and each node wants the angles of bonds coming out of it to all be equal as well.

Supplemental movie 2 | Kinetic Monte Carlo simulation of a one-dislocation lattice. The width disorder is 5 Å and each frame represents 50 Monte Carlo steps. The final frame is shown in Fig. 5a.

Supplemental movie 3 | Kinetic Monte Carlo simulation of a two-dislocation lattice. The width disorder is 6 Å and each frame represents 50 Monte Carlo steps. The final frame is shown in Fig. 5b.