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Chiral spin liquids in arrays of spin chains

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The chiral spin liquid proposed by Kalmeyer and Laughlin is a spin analogue of the fractional quantum Hall effect: it has gapped bulk quasiparticles, charge-neutral chiral edge modes and topological order in the ground state. Recently there has been unambiguous numerical evidence that the chiral spin liquid can be stabilized as the ground state of extended Heisenberg models on the kagome lattice. I will talk about an analytical approach to investigate the emergence and the properties of the chiral spin liquid phase in spatially anisotropic 2D lattices. The approach is inspired by coupled-wire constructions of quantum Hall states: starting from a quasi-1D system, we build towards the 2D limit by coupling Heisenberg chains with three-spin interactions that drive the chiral spin order. Using a renormalization group analysis, we show that the chiral spin liquid is more easily stabilized in the kagome lattice than in the triangular lattice. Moreover, using the conformal field theory that describes single chains, we explicitly construct the operators that create bulk quasiparticles and those that account for the topological degeneracy on the torus. I will also discuss possible extensions of this approach to construct more exotic quantum spin liquids.