Abstract Submitted
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Highly frustrated magnets: a class of emergent gauge systems
MICHAEL LAWLER, Binghamton University — Condensed matter exhibit a wide variety of exotic emergent phenomena, such as the topological order in the fractional quantum Hall effect, and the "cooperative paramagnetic" response of geometrically frustrated magnets. The classical and quantum dynamics of spins exploring the large configuration space associated with the latter are not well understood analytically. I consider the constrained classical Hamiltonian dynamics of spins exploring such a configuration space as a starting point from which a complete classical and semi-classical description may be reached. The method I employ, introduced by Dirac [1] and now forms the basis of gauge theory, applies to any frustrated system constrained to a continuous set of configurations. Remarkably, in the kagome lattice model I consider as an example, these dynamics are similar to the "topological" (Chern-Simons) dynamics of electrons in the fractional quantum Hall effect and have non-locally entangled edge modes as the only degrees of freedom. In principle, these edge states may be found in any kagome-like Heisenberg antiferromagnets such as Herbertsmithite, the Jarosites, $SrCr_{8-x}G_{4+x}O_{19}$ and $Na_4Ir_3O_8$.

[1] Dirac, P. A. M. *Generalized hamiltonian dynamics.* Can. J. of Math. **2**, 129-148 (1950)

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