Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Gapless Topological Order, Gravity, and Black Holes ALEXANDER RASMUSSEN, Univ of California - Santa Barbara , ADAM JERMYN, University of Cambridge, GIL REFAEL, California Institute of Technology — In recent years, there has been an intense theoretical effort to understand the low-energy properties of quantum mechanical systems where the emergent behavior has no classical analog. Systems with a bulk energy gap can exhibit topological order characterized by locally indistinguishable of states and degeneracy on manifolds with nonzero genus. Gapless systems, on the other hand, can arise out of systems without spontaneous symmetry breaking via emergent gauge structure. Seemingly unrelated, recent work by Strominger and others has related Weinberg's soft boson theorems to a new set of symmetries in both QED and linearized gravity. In this talk, we make an explicit connection between these new symmetries and the peculiar type of topological order present in the gapless pyrochlore U(1) spin liquid. This connection allows us to resolve the long-standing 1/L degeneracy splitting problem, and provides some insight into current issues with black holes.

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Date submitted: 11 Nov 2016 Electronic form version 1.4