

Abstract Submitted
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Building Quantum Materials from Optical Photons

¹ NATHAN SCHINE, LOGAN W. CLARK, CLAIRE BAUM, TIAN-XING ZHENG, NINGYUAN JIA, JONATHAN SIMON, University of Chicago — Can quantum materials be built out of light? We describe our efforts to imbue optical photons with strong interactions and design an environment suitable for the formation of material states of photons. We turn the photons into strongly-interacting cavity Rydberg polaritons, quasiparticles which inherit their spatial waveforms from the modes of an optical cavity and gain strong interactions from Rydberg excitations of an atomic gas. Granting these polaritons access to a carefully controlled set of transverse modes yields a synthetic magnetic field, in which polaritons can move and order themselves into topologically nontrivial material states.

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