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Non-Equilibrium Phases of Matter in Cavity QED

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Time-periodic (Floquet) drive has become a powerful tool to engineer new phases of matter, both in equilibrium and far from equilibrium. In this talk, I show how ideas from Floquet lead to unexpected phases of coupled light and matter when the drive photons are treated as quantized degrees of freedom, a regime known as cavity quantum electrodynamics (QED). Ideas common across condensed matter physics, from symmetry breaking to topology, all appear in a new light upon using this cavity QED mapping. Finally, I discuss possible experiments in both cavity QED systems that use ultracold atoms and cavity QED-like setups that use superconducting circuits as artificial atoms.