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Dynamical Gauge Fields in Optomechanics STEFAN WALTER, FLORIAN MARQUARDT, University of Erlangen-Nürnberg — Artificial gauge fields for neutral particles such as photons, recently attracted a lot of attention in various fields ranging from photonic crystals to ultracold atoms in optical lattices to optomechanical arrays. Here we point out that, among all implementations of gauge fields, the optomechanical setting allows for the most natural extension where the gauge field becomes dynamical. The mechanical oscillation phases determine the effective artificial magnetic field for the photons, and once these phases are allowed to evolve, they respond to the flow of photons in the structure. We discuss a simple three-site model where we identify four different regimes of the gauge-field dynamics. Furthermore, we extend the discussion to a two-dimensionallattice. Our proposed scheme could for instance be implemented using optomechanical crystals.

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