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Collective atomic motion and spin dynamics in a driven optical cavity

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Cavity quantum electrodynamics generally highlights the interchange of quantum noise and information between light and matter. I will discuss experiments in which the collective motion and spin of a trapped gas of ultracold atoms interact with and are detected by light in a single mode of a high-finesse optical cavity. I will present recent results on quantum-limited force detection, on the damping and amplification of Larmor precession through dynamical backaction, and on cavity-induced coupling between mechanical oscillators and between spin and motional degrees of freedom.