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Optomechanics in a Levitated Droplet of Superfluid Helium CHARLES BROWN, GLEN HARRIS, JACK HARRIS, Yale Univ — A critical issue common to all optomechanical systems is dissipative coupling to the environment, which limits the system's quantum coherence. Superfluid helium's extremely low optical and mechanical dissipation, as well as its high thermal conductivity and its ability cool itself via evaporation, makes the mostly uncharted territory of superfluid optomechanics an exciting avenue for exploring quantum effects in macroscopic objects. I will describe ongoing work that aims to exploit the unique properties of superfluid helium by constructing an optomechanical system consisting of a magnetically levitated droplet of superfluid helium., The optical whispering gallery modes (WGMs) of the droplet, as well as the mechanical oscillations of its surface, should offer exceptionally low dissipation, and should couple to each other via the usual optomechanical interactions. I will present recent progress towards this goal, and also discuss the background for this work, which includes prior demonstrations of magnetic levitation of superfluid helium, high finesse WGMs in liquid drops, and the self-cooling of helium drops in vacuum.

Charles Brown
Yale Univ

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