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Response and Fluctuations in an Active Bacterial Suspension

ANDY W.C. LAU, Florida Atlantic University, DANIEL T. CHEN, ARJUN G. YODH, TOM C. LUBENSKY, UPenn — An active bacterial bath consists of a population of rod-like motile or self-propelled bacteria suspended in a fluid environment. In this talk, we present a two-fluid model for the dynamics of a bacterial bath, and show, in particular, that the non-equilibrium contribution to the stress arising from the swimming of the bacteria and the non-equilibrium couplings between the alignment tensor and bacterial density, lead to i) a $1/\sqrt{\omega}$ scaling in the power spectrum of the active stress fluctuations, and ii) anomalous density fluctuations in the bacteria themselves. These predictions are observed in a recent experiment.

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