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Using a stochastic field theory to understand group behavior in microswimmer suspensions PATRICK UNDERHILL, YUZHOU QIAN, PETER KRAMER, Rensselaer Polytechnic Institute — Active suspensions of microswimmers appear both in natural biological systems (e.g. bacteria or algae) and in synthetic systems. Even without external forcing they are out of equilibrium, which gives rise to interesting properties in both small and large concentrations of the particles. These properties have been observed in experiments as well as simulation/modeling approaches. It is important to understand how hydrodynamic interactions between active swimmers cause and/or alter the suspension properties including enhanced transport and mixing. One of the most successful approaches has been a mean field theory. However, in some situations the mean field theory makes predictions that differ significantly from experiments and direct (agent or particle based) simulations. There are also some quantities that cannot be calculated by the mean field theory. In this talk, we will describe our new approach which uses a stochastic field to overcome the limitations of the mean field assumption. It allows us to calculate how interactions between organisms alter the correlations and mixing in conditions where the mean field theory cannot.

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