Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Imaging of microscale mixing in biological suspensions KWANGMIN SON, MIT, ROMAN STOCKER, MIT, ETH — In many biological processes, reaction rates are set by the degree of mixing. A prime example is virus-host infection. Protocols and approaches in the study of these processes often ignore fundamental principles on stirring and mixing, which show how difficult or lengthy it can be to truly mix biological scalars, such a microorganisms. Such results date back to the classical works of Purcell (JFM 1978) and Batchelor (JFM 1979), yet were mostly limited to theoretical predictions, which have awaited accurate experimental testing and have not made their way into biological applications to date. Here we investigate the stirring and mixing of suspensions of motile and nonmotile microorganisms by real-time imaging with optical microscopy, testing theoretical predictions and demonstrating that fundamental protocols in biology often vastly underestimate the heterogeneity in biological suspensions arising from incomplete mixing.

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Date submitted: 30 Jul 2015 Electronic form version 1.4