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Quantifying *E. coli* chemotaxis at the population level, with high spatial and temporal resolution LAURENCE WILSON, RONGJING ZHANG, The Rowland Institute at Harvard — The response of microorganisms to an external chemical stimulus is key to their survival in the wild, and so has obvious connotations for natural selection. Although much is now known about the biochemical signaling pathways that allow bacteria to respond to fluctuating levels of chemoattractant in their environment, the implications for the group behavior of cells are unknown. Previous microscopic studies have focused on single-cell behavior to build up a picture of how cells adapt to changing environmental conditions. Instead of taking this approach, we borrow ideas from light scattering, and apply them to video microscopy data in a manner similar to differential dynamic microscopy (DDM). This approach places emphasis on the local density of bacteria, allowing us to study the collective behavior of around 5000 cells simultaneously with excellent spatial and temporal resolution. We use this new method in conjunction with other techniques developed in the lab to provide a comprehensive and highly automated characterization of bacterial behavior in the presence of a chemical stimulus.

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