MAR17-2016-020612

Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Heterogeneous dynamics in the bacterial cytoplasm

BRAD PARRY, Yale Univesity

The bacterial cytoplasm is a highly crowded environment, with estimates of excluded volume reaching 40 – 60%. A diverse array of highly polydisperse components is responsible for crowding and ranges from metabolites to compact proteins to large nucleic acid polymers and macromolecular assemblies. In contrast to eukaryotic cells, bacterial cells lack membrane delimited intracellular components. To measure the material properties of the *Eschericia coli* cytoplasm, I tracked foreign particles of different sizes in various cellular states. I found particle motion to be dependent on cellular metabolism at physiological pH and exhibited dynamical properties associated with glass-like materials, including particle caging and un-caging and heterogeneous dynamics in single cells. When particle mobility was compared across populations of cells, an enormous amount of heterogeneity was measured that increased over time. This inter-cellular heterogeneity could be separated into contributions from cellular components and differences in effective cytoplasmic viscosity between cells. These findings have implications for bacterial physiology and motivate experiments and simulations in colloid-polymer mixtures with high polydispersity.