Surprises from single-particle imaging of passive and active diffusion

Steve Granick

University of Illinois, Urbana, Illinois, USA
sgranick@illinois.edu

The transport of matter and energy is fundamental in nature and biology. It can occur by passive diffusion and can also be active. Predicated on fluorescence imaging at the single-particle level, this talk describes quantitative studies of how this can happen, and presents examples of how nontrivial findings emerge from observing the rare events that underly the overall ensemble-averaged distribution. For example, in living cells, we find that transportation efficiency problems bear a provocative parallel with polymer chain trajectories with their spatial extent, and with jammed matter in their time evolution. A picture emerges in which simple experiments, performed at single-particle and single-molecule resolution, can dissect macroscopic phenomena in ways that surprise.

References