

The enzyme problem in active matter: puzzles and research opportunities

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The traditional view that enzyme kinetics is only a matter of catalyzing chemical reactions is challenged by recent experiments and theory showing that catalysis enhances enzyme mobility. This talk will report that the enhanced diffusivity of enzymes is a “run-and-tumble” process analogous to that performed by swimming microorganisms, executed in this situation by molecules that lack the decision-making machinery of microorganisms. One consequence is that enzymes migrate in the direction of lesser reactant concentration when they turn over substrate; they display “anti-chemotaxis.” This run-and-tumble process offers the possible biological function to homogenize product concentration, which could be significant in situations when the reactant concentration varies from spot to spot. We will consider even broader generalizations: diffusion changes during chemical reactions. A picture emerges in which simple experiments can dissect macroscopic phenomena in ways that surprise.



Steve Granick is Director of the IBS Center for Soft and Living Matter (South Korea). He is an elected member of the U.S. National Academy of Sciences and of the American Academy of Arts and Sciences. Among his other major awards are the APS national Polymer Physics Prize, ACS national Colloid and Surface Chemistry Prize, and Paris-Sciences Medal. He served as Chair of the DOE Council on Materials Panel on Polymers at Interfaces and Chair of the APS Division of Polymer Physics. Holding and having held Honorary and Visiting Positions at multiple universities in Europe and Asia, he has core experience in science globalization. Before his present academic position, Granick was professor at the University of Illinois at Urbana-Champaign.

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