Joint

Center for Soft Matter and Biological Science

and Condensed Matter Seminar

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Regulation of Bacterial Growth in Discrete Steps and Structured Lineages

Monday, March 20, 2017

4:00 pm—5:00 pm

304 Robeson Hall

Prodigious growth is a defining feature of bacterial life. Systems of networks change growth rates in bacteria dynamically in response to changing environments. This includes surviving stresses such as antibiotics and starvation via slowing of growth. Phenotypic heterogeneity allows a small fraction of cells to enter growth arrest by randomly crossing an internal molecular threshold, a form of bet-hedging that allows the population of cells to survive even if future environments are inhospitable to actively growing cells. Therapeutic targeting of growth arrested bacteria is a critical emerging strategy during the current rising problem of antibiotic resistance and the continued challenge of treating stubborn, chronic infections. We are taking a multifaceted approach that has opened new avenues for understanding persister formation with time-lapse microscopy and computational models. Our experiments have shown a novel persister-forming condition. In this condition, bacterial cells undergo discrete shifts in growth rate that correspond to fast molecular reshuffling events. Analysis of cellular lineages in these conditions demonstrates that cellular transitions into growth arrest are not statistically independent: closely related cells are more likely to transition together. Computational models reproduce lineage correlations with a remarkably simple set of assumptions. We discuss implications of the novel persister phenotype for pathogens surviving in changing environments, and new questions raised by our results.