



BIOINFORMATICS SEMINAR

SHILADITYA BANERJEE

Assistant Professor, Physics

CARNEGIE MELLON UNIVERSITY

BACTERIAL GROWTH AND DIVISION CONTROL UNDER STRESS

To maximize their fitness, cells must be able to respond effectively to stresses. This demands making trade-offs between processes that conserve resources to promote survival, and processes that use resources to promote growth and division. Understanding the nature of these trade-offs and the physics underlying them remains an outstanding challenge. In this talk, I will discuss our recent work combining theory and single-cell experiments to understand how cells make tradeoffs between allocation of cellular resources toward growth and division in order to maintain cell morphology under stress. Our study reveals that cell size maintenance under nutrient perturbations requires a balanced trade-off between ribosomes and division protein synthesis. Deviations from this trade-off relationship are predicted under translation inhibition, leading to distinct modes of cell morphological changes. In particular, under long-term exposure to antibiotics that inhibit translation, cells undergo dramatic shape changes to adapt and survive antibiotics. By calibrating our model with experimental data, we predict how combinations of nutrient-, translational-, and shape perturbations can be chosen to optimize bacterial growth fitness and antibiotic resistance.

BIOGRAPHY

Dr. Shiladitya Banerjee is an Assistant Professor of Physics at Carnegie Mellon University working in the area of Theoretical and Computational Biophysics. Banerjee did his undergraduate studies in Chennai, India and earned his Ph.D. in Physics from Syracuse University in 2013. After a three-year postdoctoral fellowship at the University of Chicago, Banerjee joined the faculty in the Department of Physics and Astronomy at the University College London in 2016. He moved to his current position at CMU in Spring 2020. Banerjee's notable awards include the APS prize for Outstanding doctoral thesis research in Biological Physics (2013), All-University Doctoral Prize from Syracuse University (2013), Royal Society University Research Fellowship (2018), EPSRC New Investigator award and the Human Frontiers Science Program Young Investigator Award (2018).

CBCB
SEMINAR
5/10/2021

3:30 PM

ZOOM:

<https://udel.zoom.us/j/91240820848>
(Passcode: BINF865)

bioinformatics.udel.edu

JOIN US VIA ZOOM:

<https://udel.zoom.us/j/91240820848>
(Passcode: BINF865)

Dial by your location: +1 646 876 9923 US (New York) or +1 301 715 8592 US (Germantown)
or +1 312 626 6799 US (Chicago) or +1 669 900 6833 US (San Jose) or
+1 253 215 8782 US (Tacoma) or +1 346 248 7799 US (Houston)