

To grow or not to grow: Survival strategies of bacteria to cope with hardship

Predictive understanding of biological systems requires, not only knowledge of each component, but also their interactions at the systems level. Building on an increasing knowledge of molecular details of model organisms, the development of new experimental tools and quantitative modeling allows the use of systems-level analysis to understand cellular behaviors. Employing microfluidics as a new way of live-cell culture and analyzing the data quantitatively, I will show, in the first half of the seminar, that precise and robust regulation of nitrogen uptake by *E. coli* is achieved by integral feedback control, a common engineering scheme that allows a system to track the desired set-point. In the second half, addressing the increasing antibiotic resistance of microorganisms, I will show how *E. coli* can gain multi-drug resistance via growth-mediated feedback, without the need of specific regulation.