MAE - Physiology and Biophysics Joint Seminar

Extending Synchrony and Deconvolving Population Effects in Budding Yeast Through an Analysis of Volume Growth With a Structured Leslie Model

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We have developed a Leslie model with structured volume and age classes to help us understand population growth and cell cycle synchrony in budding yeast. A prior analysis of a genetic circuit model indicated periodic gene and protein expression in phase with the cell cycle. These results led us to consider the dynamics of the cell cycle of budding yeast and experimental methods of synchronization. To date the most general experimental methods produce only weak synchrony that decays over three or four cell cycles. Existing, powerful models of cell cycle regulation were not intended to address the questions we wanted to answer. Our work has developed in two directions. First, the Leslie model predicts that volume filtration can extend synchrony by many cycles and expose periodic gene expression. We are currently implementing this filtration protocol experimentally. Furthermore, the Leslie model provides a way to deconvolve observed population averages into individual cell signals structured by age, be it constant, periodic, quasi-periodic or chaotic. Along the same lines the Leslie model has helped us to understand observed ultradian rhythms that arise through a type of metabolic synchrony. The Leslie model is parameterized with yeast physiology data derived from experiments performed over the past four decades. Another direction has been to experimentally measure time series of individual yeast volume growth with great accuracy and precision utilizing state of the art fluidic devices and novel optical techniques.

134B Farber Hall – South Campus
Thursday, May 24, 2007
Refreshments 10:45a.m.
Seminar 11:00 a.m.