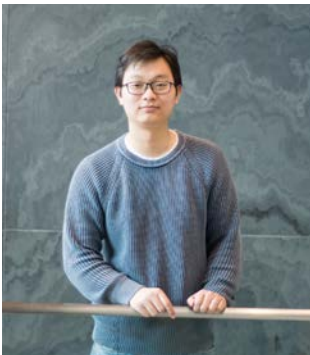




THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
COLLOQUIUM

Growth at The Single-Cell Level and The Implications of Cell-To-Cell Variability On the Population Growth

by



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Time: 4:45 - 5:45 p.m.

Place: L4, Science Centre, CUHK

(Light refreshments will be served at [SCNB 1/F lobby](#) from 4:15 to 4:35 p.m.)

ALL INTERESTED ARE WELCOME

Abstract

Genetically identical cells often display diversity in phenotypes such as gene expression levels and doubling times. Nevertheless, many experiments have shown that despite being noisy, mRNA and protein copy numbers at the single-cell level are often on average proportional to the cell volume in growing cells. Current models based on the assumption that genes and mRNAs are limiting for gene expression are incompatible with these observations. In the first part of my talk, I will present a minimal gene expression model to capture the homeostasis of protein and mRNA concentrations in exponentially growing cells. Notably, the model predicts that the exponential growth of cell volume, which has been observed across all domains of life, can be violated as the cell volume exceeds a threshold. This strong prediction has recently been experimentally verified.

In the second part of my talk, I will discuss whether cell-to-cell variability can confer benefits to the entire population by enhancing its fitness, especially in the presence of exponential growth of cell volume. I will present two models in which the sources of variability are respectively stochastic cell division and asymmetric protein segregation. Notably, the variability can be either beneficial or detrimental depending on its correlation across lineages or environmental stress, suggesting that the fitness advantage of the variability is sensitive to the intrinsic dynamics of cell growth and external conditions.