

Distinguished Lecture Series

Scaling in Development



8 June 2021 (Tuesday)

10:00-11:30 a.m. GMT+8 (Hong Kong Time)



Online via Zoom

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ABSTRACT

Within a given species, fluctuations in egg or embryo size is unavoidable. Despite this, the gene expression pattern and hence the embryonic structure often scale in proportion with the body length. This scaling phenomenon is very common in development and regeneration, and has long fascinated scientists. I will first discuss a generic theoretical framework to show how scaling gene expression pattern can emerge from non-scaling morphogen gradients. I will then demonstrate that the *Drosophila* gap gene system achieves scaling in a way that is entirely consistent with our theory. Remarkably, a parameter-free model based on the theory quantitatively accounts for the gap gene expression pattern in nearly all morphogen mutants. Furthermore, the regulation logic and the coding/decoding strategy of the gap gene system can be revealed. Our work provides a general theoretical framework on a large class of problems where scaling output is induced by non-scaling input, as well as a unified understanding of scaling, mutants' behavior and regulation in the *Drosophila* gap gene and related systems.

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Professor Chao Tang is a Chair Professor of Physics and Systems Biology and the Executive Dean of the Academy for Advanced Interdisciplinary Studies at Peking University. He had his undergraduate training at the University of Science and Technology of China and received a Ph.D. degree in Physics from the University of Chicago. In his early career, he worked on problems in statistical physics, condensed matter physics, dynamical and complex systems. His current research interest is at the interface between physics and biology, in particular systems biology and biological physics. He was a tenured full professor at the University of California San Francisco before returning to China full-time in 2011. He is a Fellow of the American Physical Society, an Academician of the Chinese Academy of Sciences, the founding director of the Center for Quantitative Biology at Peking University and the founding Co-Editor-in-Chief of the journal *Quantitative Biology*.