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**Information-theoretical approach
for understanding stochastic biological systems**

確率的生命システムへの情報論的アプローチ

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Microscopic intracellular reactions are intrinsically noisy, and individual cells behave stochastically. However, biological systems achieve stable functions (phenotypes) even though they are composed of such noisy reactions and stochastic cells. How can we understand and analyze the mechanism of the emergent stable functions out of stochastic components?

In this lecture, I will demonstrate that information theory can be a powerful tool for this purpose. Starting from the input/output relation in biological systems, I will introduce the notions of information measure that can characterize stochastic input/output relation. In addition, the concepts of information transmission, information encoding, and information decoding will be discussed together with their relevance for understanding biological systems.

Keywords: Cellular decision-making, stochasticity, robustness, information theory, nonlinear dynamics