Stochasticity in intracellular networks and its mathematical evaluation

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An intracellular network is full of noise. Even though the presence of stochasticity in intracellular networks has been recognized since a couple of decades ago[1], roles of stochasticity in intracellular networks are not yet understood enough.
From the theoretical viewpoint, one of the important issues for understanding stochasticity is how to evaluate fluctuation in molecular species involved in intracellular networks.

This issue is not yet solved mainly because chemical reactions can work as the sources of fluctuation and the propagators of fluctuation simultaneously and they are inseparable. In addition the feedback structures in the intracellular networks make it more difficult to understand how the fluctuation of molecular species is determined by the combination of the two roles of chemical reactions.

In this presentation, I show a mathematical method that solves the issue partially[2]. The method allows us to systematically obtain a mathematical representation of stochasticity in an intracellular network that is easier for us to understand its meaning. Several applications of this method are demonstrated.

In addition, some problems on the relation between stochasticity and circadian rhythms will be discussed.

1. "Distribution of Suboptimally Induced β-D-Galactosidase in *Escherichia coli*",PC Maloney & B Rotman, J.Mol.Biol., 1973, Vol.73, p77-91.
2. "A Mathematical Study on Intracellular Chemical Reaction Networks", TJ Kobayashi, PhD. Thesis, 2005, Univ. Tokyo.