



THE UNIVERSITY OF CHICAGO

COMPUTATIONAL AND APPLIED MATHEMATICS COLLOQUIUM

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Biological Implications of $SO(2,1)$ Symmetry in Exact Solutions of the Chemical Master Equation for a Self-Repressing Gene

THURSDAY, November 2, 2017, at 5:00 PM
Jones 226, 5747 South Ellis Avenue

ABSTRACT

Symmetries described by Lie algebras have been used extensively in quantum mechanics, but very little in biology. In this talk I will discuss the chemical and biological meaning of the symmetries underlying the exact solutions of a stochastic negatively self-regulating gene. The breaking of symmetry at low molecular number causes three effects. Average protein number differs from the deterministically expected value. Bimodal probability distributions appear as the protein number becomes a readout of the ON/OFF state of the gene. Two branches of the solution exist, having high and low switching rates, such that the low switching rate branch approaches deterministic behavior and the high switching rate branch exhibits sub-Fano behavior.

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