Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Accurate analytical distributions for stochastic gene expression HODJAT PENDAR, Engineering Science and Mechanics Department, Virginia Tech, RAHUL KULKARNI, Department of Physics, Virginia Tech — Gene expression is significantly stochastic process that can give rise to phenotypic heterogeneity across a population of genetically identical cells. Gene expression variability is generally characterized by the mean and variance of associated distributions, however the entire distributions are often not adequately characterized by the first two moments. For stochastic models of gene expression, exact analytic results for protein steady-state distributions have been obtained only for the simplest case. In this talk, we show how to obtain approximate but accurate representations of protein steady-state distributions for a broad class of models of stochastic gene expression. We first present a procedure to obtain analytical solutions in two limiting cases as the ratio of mRNA to protein lifetimes is varied. We then propose a general strategy for constructing an analytical distribution that interpolates these limits while reproducing the exact mean and variance. The corresponding analytical distributions show excellent agreement with results from stochastic simulations throughout parameter space.

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Date submitted: 21 Nov 2011 Electronic form version 1.4