EXACT RESULTS IN SELF-REGULATING GENES

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ABSTRACT

Gene regulation is a complex process involving many biochemical reactions with proteins being final products. Here we will discuss simple models of self-regulating genes. Protein molecules may bind to promoter regions of DNA and repress or activate their own production or production of other proteins. The general goal is to obtain approximate formulas for expected values and variances of the number of protein molecules in stationary states of appropriate birth and death Markov jump processes.

We will discuss self-repressing genes with time delays of protein production and degradation. We will use self-consistent mean-field approximations and methods of singular perturbations with small parameters being a time delay or the inverse of the adiabaticity parameter.