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The Origin of Power Law Distributions in Protein Synthesis JEFFREY BARKER, CHUCK YEUNG, Pennsylvania State Univ. at Erie, XIAO-LUN WU, EMILY CHAPMAN-MCQUISTON, University of Pittsburgh — A genetically identical bacteria population will show heterogeneous gene expression due to the stochastic nature of the protein production mechanism. Therefore, the probability distribution of the resulting protein(s) can be used to gain information about these underlying processes. The experiments of Chapman-McQuistion et. al. show that under certain circumstances the protein probability distribution has a power law form $p(n) \sim n^{-\alpha}$ at small n. Our simulations and analysis find, in agreement with work by Friedlander and Brenner, that a linear protein production rate will produce a power law distribution with the exponent depending on the amplitude of the production rate. We also find that a protein distribution generated by rare occurrences of large bursts will produce a distribution of the form $p(n) \sim 1/n$.

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