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Noisy out of necessity: Probabilistic behavior during cellular differentiation

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Diverse organisms ranging from bacteria to mammalian stem cells undergo pluripotent differentiation where a single cell can commit to one out of several cell fates. How do underlying genetic circuits comprised of interactions between genes and proteins allow cells to “choose” a specific cell fate and execute the appropriate differentiation program? To address this question we investigate a simple bacterial differentiation system utilizing mathematical modeling and quantitative single cell measurements. In particular we are interested in elucidating the role of circuit dynamics and stochastic behavior in cellular differentiation.