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**Ruth J. Williams.** *Oscillatory behavior of a genetic circuit with delayed negative feedback.*

Dynamical system models with delayed feedback, non-negativity constraints and small noise arise in the study of simple genetic circuit. Under certain conditions oscillatory behavior has been observed. Here we consider prototypical diffusion (second-order) approximation for such a system — a one-dimensional stochastic delay differential equation with a non-negativity constraint — along with its deterministic analogue. We establish conditions for existence, uniqueness and stability of “slowly oscillating” periodic solutions to the deterministic equation and show that solutions to the small noise stochastic equation remain close to these periodic solutions from the perspective of large deviations. This is joint work with Ruth Williams. (Received September 21, 2015)