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Exponential sensitivity of noise-driven switching in genetic networks PANKAJ MEHTA, Princeton University, RANJAN MUKHOPADHYAY, Clark University, NED WINGREEN, Princeton University — Cells are known to utilize biochemical noise to probabilistically switch between distinct gene expression states. We demonstrate that such noise-driven switching is dominated by tails of probability distributions and is therefore exponentially sensitive to changes in physiological parameters such as transcription and translation rates. However, provided mRNA lifetimes are short, switching can still be accurately simulated using protein-only models of gene expression. Exponential sensitivity limits the robustness of noise-driven switching, suggesting cells may use other mechanisms in order to switch reliably.

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