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Patterns and Oscillations in Reaction-Diffusion Systems with Intrinsic Fluctuations MICHAEL GIVER, DANIEL GOLDSTEIN, BULBUL CHAKRABORTY, Brandeis University — Intrinsic or demographic noise has been shown to play an important role in the dynamics of a variety of systems including predator-prey populations, biochemical reactions within cells, and oscillatory chemical reaction systems, and is known to give rise to oscillations and pattern formation well outside the parameter range predicted by standard mean-field analysis. Initially motivated by an experimental model of cells and tissues where the cells are represented by chemical reagents isolated in emulsion droplets, we study the stochastic Brusselator, a simple activator-inhibitor chemical reaction model. Our work extends the results of recent studies on the zero and one dimensional systems with the ultimate goals of understanding the role of noise in spatially structured systems and engineering novel patterns and attractors induced by fluctuations. In the zero dimensional system, we observe a noise induced switching between small and large amplitude oscillations when a separation of time scales is present, while the spatially extended system displays a similar switching between a stationary Turing pattern and uniform oscillations.

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