

Figure 4.3 Robustness comparison of two population growth models. (A) The posterior distributions of the two models. (B-D) The models were simulated using ODE, MJP and SDE. Both the cuboid and the ellipsoid approximations agree with ABC-SysBio model selection results. Each analysis was repeated three times. The height of the bars indicate the mean robustness from the three repeats and the error bars represent the standard deviation.

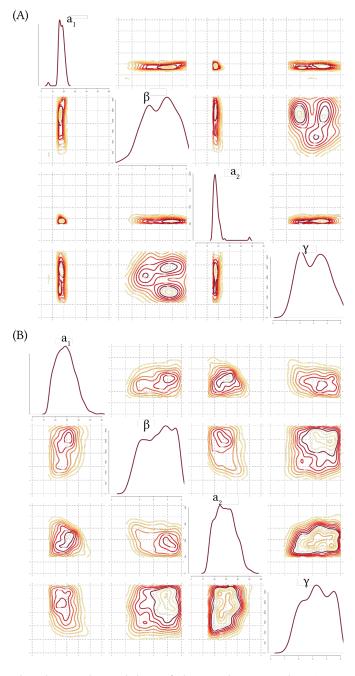


Figure 4.5 Elucidating the stability of the Gardner switch. The Gardner model has four parameters, for which I want to find the values for which this system is bistable. I use StabilityFinder to find the posterior distribution of the bistable Gardner switch, deterministically (A) and stochastically (B). The posterior distributions are shown as the density plots of each parameter as well as each one plotted against the other.

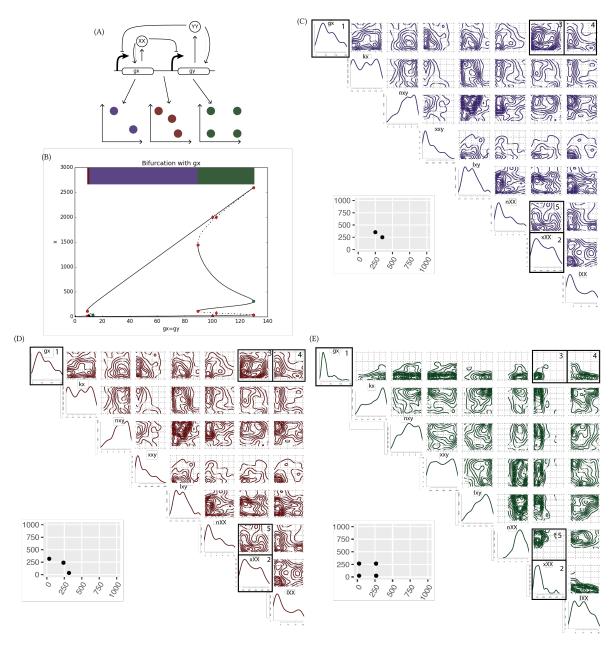


Figure 4.10 Design principles of multistable switches. (A) Using the Lu model with added positive autoregulation we uncover the design principles dictating if a switch will be bistable, tristable, or will have 4 steady states. (B-D) By considering the bivariate distributions of the parameters we can uncover the differences in the parameters of a bistable switch compared to a tristable switch, compared to a quadristable switch. The posterior distribution of the bistable switch is shown in purple, of the tristable switch in red and of a quadristable in green. The bivariate distributions for which a difference is observed between the stabilities are in black boxes. An example of a phase plot from each behaviour is shown next to the corresponding posterior distribution.