

Biology of the *noisy* gene

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Noise in gene expression. Summary

- I discussed how noise is *intrinsic* to one of the most basic cellular processes, i.e., gene expression. This is based on the fact that gene expression is constituted by stochastic bio-chemical reactions.

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- I introduced several techniques to understand the factors determining noise. In this way, we learned about master equations, steady-state probabilities, coefficient of variation, etc. We applied these techniques to several models, starting with the simplest one, describing protein production as a birth-and-death process. These models lead to new biological insights, e.g., transcriptional/translational bursting and their connections to phenotypic noise.

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- I presented several studies where noise was analyzed experimentally. In bacteria, noise was initially believed to be determined by the efficiency of translation. It was also differentiated between intrinsic and extrinsic, the first having a faster time scale. Similar experiments were done in yeast leading to a general model of gene expression noise including the processes of 1) gene activation/inactivation, 2) transcription, and 3) translation. System-wide studies revealed a characteristic scaling between noise and mean gene expression in natural contexts. This scaling was linked to mRNA fluctuations.

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Reviews

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