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Bursty Gene Expression in Single Cells and Expanding Populations: A Discrete Approach

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Gene expression is inherently stochastic, resulting in **cell-to-cell variability in protein levels**, even among genetically identical cells.
Such **variability plays a crucial role** in such processes as cell differentiation, stress response, and antibiotic tolerance.

- Proteins are synthesized in instantaneous discrete events, **bursts**, each producing a random number of proteins.
- **Protein levels are decreased by dilution** due to active cell growth.
- **Positive feedback on dilution**: an increase in protein levels imposes a burden on the cell, reducing its growth rate and thereby slowing down dilution.

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