**Transcriptional regulation by activators**

Biochemical equations:

Cooperative binding of activator:

Transcription from activator-bound DNA:

Leaky transcription from free DNA:

mRNA degradation and dilution due to cell growth and division:

Protein translation from mRNA:

Protein degradation and dilution due to cell growth and division:

Light activation of activator

Where A0 = inactive activator, R = light activated activator able to bind DNA

ODEs:

Model reduction based on quasi-stationary approximation and conservation law

For **YF1/FixJ (pDusk)**, assuming concentration of activated activator is inversely proportional to light intensity

The model becomes

At steady state,

Where , , ,

**Translational control by repressor – PAL**

Biochemical equations:

Transcription:

mRNA degradation and dilution due to cell growth and division:

Repressor binding to free mRNA:

Protein translation from free mRNA:

Leaky translation from repressor-bound mRNA:

Protein degradation and dilution due to cell growth and division:

ODEs:

Conservation law

Quasi-stationary approximation

Where ,

Assume

At steady state,

Where , , ,