

Exercise:

G2 Checkpoint in the Frog Cell Cycle

Objectives

1. Apply BioNetGen to a real signaling pathway.
2. Observe feedback mechanisms and hysteresis in cell signaling.

Background

You have three source materials to work from:

A class module describing the G2 checkpoint in the frog cell cycle.

An exercise set based on the module.

The research paper on which the module is based (this is included primarily for interest, the class module and exercise set are self-contained)

Exercises

1. *Close reading (overnight)*: Individually: read the module. As you read, look up key terms you don't know. Write questions in the margins, but keep going.
2. *Review (30 minutes, as a team)*: Go through the questions that each member asked; try to start with the "What does this word or sentence mean..." questions, leaving the deeper questions until the entire team understands the gist of the module.
3. *Gathering material for modeling*: Over the course of the assignment, you will create a BioNetGen model based on the signaling described in the module and (following a set of carefully-crafted exercises) use the model to understand how cyclin and other proteins regulate passage through the G2 checkpoint.

Question to discuss with team: Where is the process modeled in the module? (Hint: there are several models, at different levels – most of them will be useful at some point or other).

What will be helpful in developing the BioNetGen model and how?

4. *Manual Modeling*: Using the module, try to create a SBGN model and a RuleBuilder or BNGL model for Figure 3. What ambiguities do you see? How did you resolve them?

We'll discuss issues once you have defined your initial models.

5. *Computer Modeling*: Create an initial computer model, based on the above, and start doing the exercises.