

## SURF 2015 GOTChA chart

### Goals

- Create a library of biological components of the processes implemented and their functions and interactions (macromolecules and RNA)
- Test the prototyping capabilities using a sample system *in vitro*
- Help develop a prototyping framework for sub-cellular biological processes using MATLAB

### Technical Challenges

- Knowledge limitations regarding MATLAB and circuit design
- Resource limitations for specific circuits *in vitro*: If the circuit is too large, it may use up resources before informative behavior can be seen
- Variability in experimental medium (extract) : The experimental results may not generalize well in MATLAB due to this variability
- Crosstalk between circuit components: individual characterizations of parts may not be accurate when multiple parts are in the same tube

### Objectives

- Study the interactions of different components in a sample system to accurately characterize each component (8-12 promoters, 20-24 total)
- Components include IPTG, LacI, Ara, luxR, tetR, etc.
  - Use variable concentrations of each component with GFP to determine properties like promotion strength, repression strength, and binding strength to inducers
- Develop specific parameters associated with promotion strength, repression, and induction for each component
- Involve those parameters in a model in MATLAB to attempt to predict circuit behavior
- Test the model's accuracy by comparing it to *in vitro* sample systems
  - Prototype different circuit designs
  - Characterize parts and improve system design iteratively

### Approach

- Before the SURF starts, I will learn some basics of MATLAB and biological circuits
- To overcome resource limitations, I can consider modular testing- testing a few parts of the circuit at a time in individual modules and continuing to test permutations of modules
- I can use only one batch of extract for all experiments to ensure consistency
- Modular testing will also help to quantify crosstalk from the data- by testing individual components and then modules I can iteratively characterize crosstalk and include it in the model

## Sources

- [http://www.cds.caltech.edu/~murray/books/AM05/pdf/bfs09-L2\\_analysis\\_26Aug09.pdf](http://www.cds.caltech.edu/~murray/books/AM05/pdf/bfs09-L2_analysis_26Aug09.pdf)
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