System Engineering
M2D1

10.13.11
Abstracted View of Bacterial Photography

Design Goal: improve dynamic range
Practically speaking: lighter in the light
Inside the light sensing device
2 plasmids needed

Cyanobacterial light sensor = Cph1
EnvZ cytoplasmic responder

Synechocystis
haem into phycocyanobilin
Inside the color generating device

Modification of Two Component Signaling

<table>
<thead>
<tr>
<th>System</th>
<th>NATURAL (Osmolarity)</th>
<th>MODIFIED (light)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor</td>
<td>Env2</td>
<td>Cph8</td>
</tr>
<tr>
<td>Responder</td>
<td>ompR</td>
<td>ompR</td>
</tr>
</tbody>
</table>

- **Sensor**: Env2, Cph8
- **Responder**: ompR, ompR

Genome: Env2lacZ

Color Generating Device
b-gal activity produces color: in liquid ONPG

Must be in the linear range

Amount of yellow color

Amount of b-galactosidase
Measuring β-gal activity

Protocol
1. Measure concentration of cells
2. Lyse cells
3. Start Reactions
4. Stop Reactions
5. Spin
6. Measure yellow color and debris

\[ 1 \text{ Miller Unit} = 1000 \times \frac{(\text{Abs}420 - (1.75 \times \text{Abs}550))}{(t \times v \times \text{Abs}600)} \]
Today in lab

- Practice bang NBS
- Back photo to light
  - Setup 15 Back Photo to light
  - 15 dark