Meeting minutes: 4/16/10

Project proposals:

1. Matt, steve, bob:
   Bacterial Thermoregulator:
   Get bacteria to maintain homeostasis in fluctuating external temperature
   Introduce genes coding for temperature sensitive genes or RNA to act as promoters to start a process to release a large amount of heat.
   Applications: for high temp. microbes, applications to thermophiles in industrial applications, central heating, anywhere heat is used.
   Problems: enzyme stability—reduction of Nitrous oxide. Does it diffuse into cells? How do we get it into cells? Metabolic rate?
   cspA mRNA changes conf. at low temp. (temperature sensitive RNA). Responds to cold shock. Cis regulator. Changes secondary structure depending on the temp. of the environment. Check Kyoto project—wanted bacteria to raise temp. of mars so life could be maintained.
   N2O reduction—released 82.05 kJ/mol, only need one enzyme (nitrous oxide reductase).
   Feasibility: strength of the promoter would have to coincide well with metabolic rate, trial and error to find right balance.
   Cooling: to maintain homeostasis, would need to find way to cool the bacteria. Maybe reverse the process we'd be using to generate heat. Require another set of genes, promoter. Heat sensitive lambda promoter in registry. Exocytosis to cool the cell, similar to how mammals maintain homeostasis, sweating.
   Insulator—capsule?
   Comments: e.coli has advanced heat shock system. Many proteins to stabilize, involves mRNA. Cold just slowing down rate of reactions. Hard to get bacterial density up in a solution to generate enough heat. Possible spin to try to evolve a thermophilic version of e.coli, then sequence genomes. But there wouldn't really be a biobrick.
   Insulator/capsule under temperature dependent promoter is feasible.
   Evolution at specific temperatures.

2. Amanda, Meagan:

   Multiple contaminant whole cell biosensor in e.coli
   Builds off bacterial decoder from last year
   Water contamination techniques. Detection techniques today are not always reliable.
   whole cell biosensor: sensing component (usually resistance gene) reporter gene.
   biosensors have been done in the past but only single input and single output. Ours would take multiple inputs to give an output based on the input.
   arsenic, lead.
   ars operon—resistance gene, pump to pump out arsenic. Couple it to a reporter gene
   pbrr—protein that binds selectively to lead ions. Clones into e.coli before so feasible.

theoretically simple, practical application of last years project.
proplems: need to make it more sensitive than it is in nature for the ars operon. Not entirely sure what the products of the ars operon are. Don't know much about lead sensing component. Need appropriate inputs, research what compounds are in water, what's feasible to detect.
past projects: the traffic light project—altered promoter such that it's stronger or weaker than wild type. Possible way to sense different levels of contaminants. We could alter ars promoter in similar way.
increasing sensitivity.

Comments: not exactly a true application of last years decoder, maybe have it detect something beneficial vs something dangerous like ars. Or make a degrader instead for endocrine disrupters or estrogen. Pathogen contamination, parasites.

Didn't get anything for RNA project b/c was presenting…

Post-presentation comments:

Synthetic RNA—easy to manipulate but not necessarily an effective regulator. No real definite application.

Continuing the decoder: we'd have to find a direct application, something that needs to be decoded. Or maybe even just get it to work since we have the parts. New inputs/outputs. Degrade contaminants.

We chose the decoder!

Think of what we can add to it, what we can decode, degradation of estrogen and endocrine disrupters. Still gonna use small RNA, 2 to 4 decoder.