SEED Academy, Spring 2011
Synthetic Biology Module

Homework #2
Due February 26, 2011

There are two principle objectives for this homework assignment. The first question will get you to begin to think more deeply about your final projects. The next questions will introduce you to the process of *cloning* a piece of DNA and the framework in which we will think about manipulating DNA in this course. Almost anything that happens in synthetic biology (and just about every other biological science or engineering) begins with the process of cloning. This will be your lab work for the semester. *Note*: The only written parts of this assignment are Problems 2 and 3.

1) Since we have had a more in-depth discussion about biological engineering and synthetic biology, we want you to return to your initial list of ideas for the system you would like to create. From that same list, or using additional ideas that you may have recently thought of, choose 2-3 of your favorites and think about the following:

   What actually has to happen in order for this system to work?
   (Remember: *Engineering → HOW?)*

   Take the "bacterial balloon" (from the comic) as an example. Think about an *actual* balloon and ask yourself, "*How* does this actually work?"

   1. Why does a balloon float instead of sink?
   2. Do balloons float forever? Why or why not?
   3. Can any material be used to make a balloon? Are there special properties required of a material to be suitable to make a balloon?
   4. When blowing a balloon, there seems to be an initial "barrier" one must overcome before easily/smoothly filling it. What is this? Why is this?

   What you should do is start thinking about these questions now. You will not need to hand in anything to us regarding your projects until SEED Saturday 4. If you think about these questions during the current week, however, we encourage you to send them to us early, and we will help you get started framing these questions in a biological perspective.

2) Read the Session 3 overview and *answer the Pre-Lab questions* (http://openwetware.org/wiki/SEED/2011/Schedule). All answers to the questions can be found in the Session 3 overview reading. You can watch the online tutorial *after* you have finished answering the questions (i.e. you do not need to watch the tutorial in order to answer the questions).

3) The Registry of Standard Biological Parts is a collection of genetic parts that can be mixed and matched to build synthetic biology devices and systems. This will be one of your most important resources for the remainder of the semester. The goal of this problem is to introduce you to the registry and also give you a better idea of how synthetic biology works.
Go to the registry (http://partsregistry.org/Main_Page) to answer the following short questions. You may also find the Help page (http://partsregistry.org/wiki/index.php/Help:Contents) very useful. Note that this problem has two parts (*a* and *b*).

(*a*) Define the following terms:

BioBrick

Composable (*composability*)

Abstraction (*Abstraction Hierarchy*)

Restriction Enzyme

Plasmid

(*b*) Name 2 different types of parts and 2 different types of devices. Draw the "symbol" for the part/device (e.g. arrow, rectangle, "stop sign," etc.). Write a few words about how the part/device works.