Student Name:
Term:
Direct Supervisor: Jonathan Babb
Principal Investigator: Ron Weiss
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Synthetic biology is an emerging field that focuses on designing organisms to solve practical problems. Thanks to advances in molecular biology and genetics over the past 50 years, scientists and engineers can now clone DNA, write DNA sequences from scratch, splice together sequences, and insert these recombinant sequences into a variety of bacterial, plant, and animal cells. Synthetic biologists apply engineering techniques to molecular biology, using these processes to make reliable, robust devices. One such engineering technique is abstraction: synthetic biologists build and characterize biological parts made of individual genes, then use the "black box" properties of these parts to build still more complex devices. Another such technique is modeling. In the same way a civil engineer simulates a bridge before ordering its construction, a synthetic biologist aims to predict the behavior of an organism before he/she expends time and resources to build it in the lab.

The International Genetically Engineered Machine competition (iGEM) is an undergraduate synthetic biology competition that revolves around these techniques. Working in an all-undergraduate team, participants must propose, design, build, and test a novel organism. Teams begin with a library of standardized, interchangeable parts, most of them well-characterized to allow for quantitative modeling, and are encouraged to submit novel parts of their creation to the library. As a member of the MIT iGEM team, I will contribute to the iGEM design process at all levels, from initial brainstorming, through implementation and testing, to presenting at the North America East Regional Jamboree. I will work on a team of around 12 undergraduates, mentored by Professor Ron Weiss and a group of graduate students in the Synthetic Biology Center (Building NE47, Room 215). The iGEM project will last through Fall 2012, with most implementation and testing in the summer, and competitions in the fall.

This semester (Spring 2012), my responsibilities include brainstorming project directions, reviewing literature for information relevant to our project direction, using the Registry of Standard Biological Parts to locate suitable parts for our organism, and modeling gene expression networks and biochemical pathways. On the wetware side, I will learn biological lab techniques and help automate lab procedures by programming a Tecan fluidics robot. After the design phase, I will use these techniques to build, test, and analyze our organism. To communicate our results, I will update the Registry of Standard Biological Parts with any novel parts or devices that the team creates, help create a team website, and work on presenting our

results in written and oral form to judges. This work may extend into a summer UROP in the same project.

My personal objective in this project is to figure out whether a career in synthetic biology suits me. Because the competition allows me to actively direct a project from planning to completion, participating in iGEM is a good analogue to working as a professional synthetic biologist. If I enjoy my iGEM experience, I will pursue future courses, labs, and internships in synthetic biology; otherwise, I still have plenty of time to explore other fields. In this sense, I see the iGEM UROP as a great way for me to immerse myself in synthetic biology as a freshman without committing to a major.