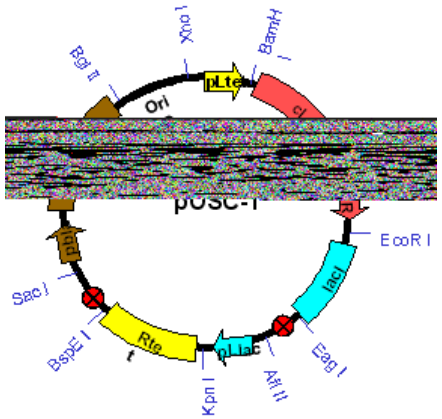
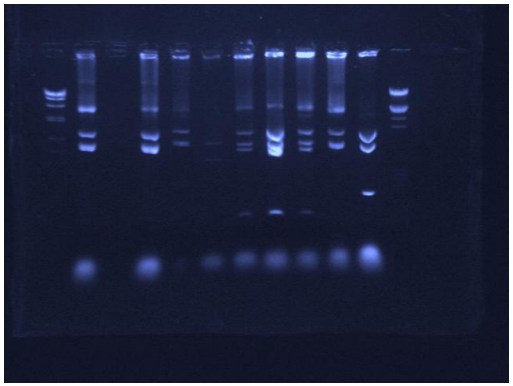
INTRODUCTION

From heartbeats to breathing, most systems in the body function in an oscillatory fashion. However, we have no idea how many of these systems are regulated. In other words, we do not understand how these bio-chemical elements come alive and function in unity. In order to obtain a better understanding of how life works on a molecular and bio-chemical level we need to study a dynamic genetic system. Thus, we have elected to utilize a simple oscillatory system in our study. To create this oscillatory system we first had to model it mathematically and then create it biologically.



OBJECT

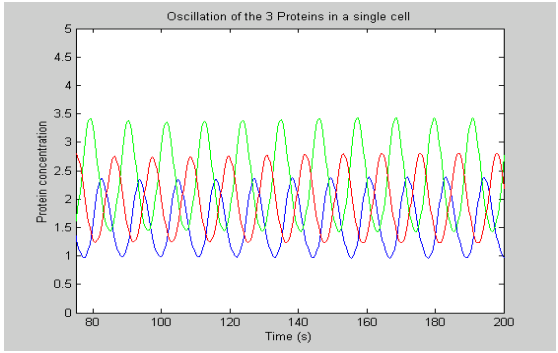
The purpose of this project was to study how genes and their protein products inter-react with in a living organism. Thus, the superficial objective of this project is to create an oscillating metabolic pathway.



DNA Gel. Nov. 9.2005

HOW?

To do this we are creating a plasmid with a series of promoters, which turn on three different genes that code for fluorescent proteins. Fluorescent proteins are ideal for this experiment because we can see which cells are in what stage in the cycle. The model we are currently using is E-coli. Ultimately, we would like to synchronize the e-coli, so that they would all create the same proteins at the same time. We would also like to create a similar system in a vertebrate, such as a fish.



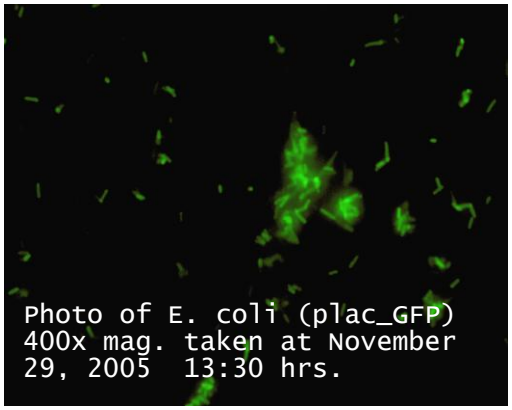
WHAT WE ARE DOING

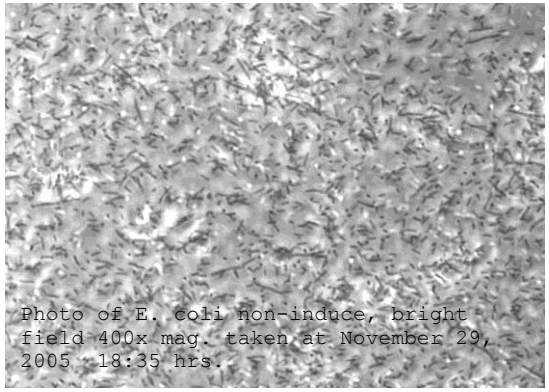
Prior to this semester, the mathematical models for the oscillator had already been done, and the pieces for the plasmid had been selected and ordered and isolated. This semester in the lab, we perfected techniques and combined most of the genes.

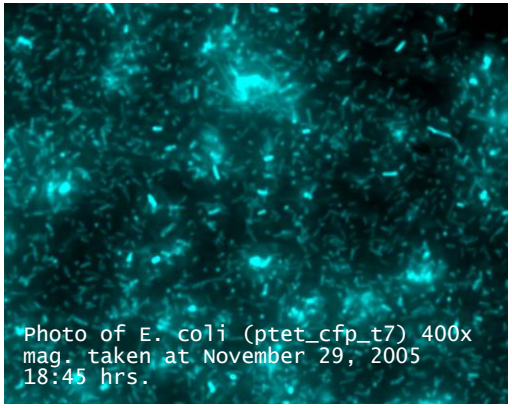
In addition to the lab work, we designed a way to synchronize the plasmids so that they oscillate together. This involved mathematical modeling of the oscillatory system to determine the best locations for genes within the plasmid. Also, we had to find a place to order the genes from. Next semester in lab, we are going to finish assembling the oscillator, begin work on synchronization plasmid. Additionally, we would like to locate and model promoters, which would work in a fish, so that we can put the system into a vertebrate model.

Diagram of Multi-colored flashing fish.

RESULTS







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IPRO 302

Synthetic Biology:

Engineering Novel Organisms

Fall 2005

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