

BioE 301A: Molecular and Cellular Engineering Laboratory
Winter 2008
Tuesday/Thursday 1-4 PM

Instructors

Professor Jennifer Cochran, Ph.D. (cochran1@stanford.edu)
Office Hours: Fridays 11AM-12PM, W250

Teaching Assistants:

Kai Chan (yingkai@stanford.edu)
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Grading

In-class participation and lab notebooks: 50%

Lab notebooks will be collected at the end of the class on Thursday Jan 24, Thursday Feb 14, and with the final reports by Friday March 21 at 5 PM.

Final Report: 50%

*The final report will be due on the last day of the quarter, Friday March 21 at 5 PM.
This report will be submitted by each group of 2 or 3 students.*

Students, in pairs or teams of three, will complete a single experimental module throughout the quarter, applying common molecular biology and molecular bioengineering wet lab techniques. There are two modules that students will choose between. One module will involve directed evolution to engineer green fluorescent protein (GFP) mutants. Such proteins are commonly used for visualizing expression and localization of other proteins in cells. The other module will center around microarrays, in which students will print their own microarrays and use them to compare gene expression in bacteria under different conditions. There will also be short assignments, mostly in class, related to the experimental modules. All experimental techniques will be taught, but we will emphasize an experimental thought process. Emphasis will be on learning and applying molecular and cellular engineering lab techniques, maintaining a thorough “wet lab” notebook, applying experimental problem solving thought processes, and writing a professional final report in the style of a journal article.

Background reading

Microarrays:

Lucchini, S., A. Thompson, and J.C. Hinton, *Microarrays for microbiologists*.
Microbiology, 2001. **147**(Pt 6): p. 1403-14.

Wei, Y., et al., *High-density microarray-mediated gene expression profiling of Escherichia coli*. J Bacteriol, 2001. **183**(2): p. 545-56.

Khodursky, A.B., et al., *DNA microarray analysis of gene expression in response to physiological and genetic changes that affect tryptophan metabolism in Escherichia coli*. Proc Natl Acad Sci U S A, 2000. **97**(22): p. 12170-5.

Directed evolution:

Stemmer, W.P., *Rapid evolution of a protein in vitro by DNA shuffling*. Nature, 1994. **370**(6488): p. 389-91.

Cramer, A., et al., *Improved green fluorescent protein by molecular evolution using DNA shuffling*. Nat Biotechnol, 1996. **14**(3): p. 315-9.