Research in the Biological Sciences (RIBS) 
A Laboratory Course in Molecular and Microbiology

Course Instructors:
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TAs:
To be determined

Course description:
During RIBS, you will be exposed to a broad range of molecular, genetic and cellular biological techniques currently used in research laboratories. You will be trained in laboratory research; however, the emphasis is on the training rather than on the projects. The main goals of RIBS are to teach you some basic lab skills and to give you the confidence to work in a research laboratory. On a space-available basis, we will invite back students the following summer to carry out a research project in one of the faculty labs on campus.

Course objectives:
• Develop skills and confidence important for succeeding in a laboratory.
• Learn some basic lab operations and techniques.
• Learn how to design and carry out a research project.
• Learn how to present results clearly and concisely
• Develop skills important for productive collaborations - working in groups

Schedule: The class will run from 9:30 AM to 5:00 PM with an hour break for lunch. Most of the time will be spent in lab. Background lectures will supplement the labs.

Lab notebooks: Students will receive a lab manual with detailed instructions for each of the labs. Students are required to keep a lab notebook; spiral bound notebooks will be available for purchase.

Evaluation:
Lab journals (notebooks) 30%
Misc. Presentations 10%
Final Project paper 15%
Final Project poster presentation 15%
Class Participation 30%
WEEK 1

- **Goals and overview of RIBS**
- **Lab Safety**
- **Lab Basics** - how to use micropipetters, how to prepare solutions, how to plan an experiment, etc.
- **Molecular Biology** - students will learn and perform traditional techniques used in cloning genes - e.g. restriction digestion, purification of DNA fragments, transformation of E. coli, DNA minipreps, gel electrophoresis. Students will clone a *C. elegans* gene involved in the osmotic stress response.
- **C. elegans Project** – students will begin studies of the physiological response of the nematode *C. elegans* to osmotic stress (high salt levels). They will follow up the preliminary observations with an RNA interference experiment, where, using the gene cloned in the Molecular Biology module, the students will disrupt the ability to respond normally to osmotic stress.
- **Microbiology Basics** – students will learn basic techniques in working with bacteria.

WEEK 2

- **Human Taste Receptor Variation** – DNA with a dash of bitters! We take a classic and common genetic test for the ability to taste the bitter compound PTC and add a molecular twist to it. Students will PCR amplify the PTC receptor from their own DNA and submit the PCR products for DNA sequencing. The goal will be to identify the genetic basis for differences in the ability to taste PTC. Later in the week, students will analyze the DNA sequence of their taste receptor gene, correlate particular variations with the ability to taste PTC, and discuss the interesting evolution of this locus.
- **Microscopy Basics** – students will learn how to use microscopes - includes dissecting and compound scopes, phase contrast optics and differential interference contrast (DIC) optics.
- **C. elegans Project** – Using the technique of RNA interference (RNAi), we will knock out expression of genes involved in the osmotic stress response in the worm. Can the worms still handle high salt? Using fluorescence reporters, students will monitor intracellular events that result from osmotic shock.
- **Cell Culture** – students will learn the basic steps in passaging and culturing cell lines. They will culture a mouse immune system B cell line and look at the effects of various drugs on the ability of the cells to proliferate.
- **Fluorescence Microscopy** – examine organelles and structures within the cell using fluorescence microscopy.
- **Presentations** – based on assigned topics or research papers.
- **Group Project** - students select independent group projects to be performed on Weeks 3 & 4.

WEEK 3

- **Presentations** – research paper figure
- **Presentations** – project update
- **Group Projects** - students begin working on group projects

WEEK 4

- **Group Projects**
  - Complete group projects.
  - Prepare reports and poster presentations on projects.
  - Poster presentations (last day of class).