Marine Molecular Biology
BI 457/557 Fall 2011

Syllabus

The purpose of this course is to provide hands-on experience with basic universally applicable molecular techniques in a context of group research projects focused on local marine organisms. Students generate novel sequence data and learn to analyze it using databases (such as NCBI Genbank) and a variety of sequence and phylogenetic analysis software (e.g. Codon Code Aligner, ClustalX, PAUP, Treeview). We usually have a field trip or two to collect material for the course, but most of our time is spent on laboratory exercises, tutorials, lectures and discussions. Students practice DNA extraction, gel electrophoresis, PCR, and sequence analysis. We read and discuss current scientific literature on the use of molecular methods in marine biology research. Each student is expected to maintain a detailed laboratory notebook. Students participate in writing a final paper to summarize the results of research project(s). Graduate students play leading roles in defining research projects and are responsible for the intellectual content of the final paper. Undergraduate students are expected to participate in writing by describing the methods and results.

Learning goals:

1. Become familiar with how molecular techniques are applied in marine biology by reading and discussing relevant scientific literature and participating in research projects.
2. Gain laboratory experience and become comfortable with basic molecular techniques.
3. Learn to analyze sequence data using a variety of software tools.
4. Practice keeping a detailed laboratory notebook.
5. Participate in writing a scientific report paper based on the research projects you carry out in class.

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Teaching Assistant: April Bird (aprilb@uoregon.edu)

Class meets in the McConnaughey teaching lab at the OIMB
8:30 - 17:00 Wednesdays (1 hour break for lunch at noon)
10:00 - 11:00 Fridays

Office Hours: drop by any time

Required reading: No textbook is required. Reading is assigned on a weekly basis.

Week 1 (Sept 28, 30) Boat trip to collect plankton. *Lecture*: Plankton diversity. *Lab*: DNA extraction from individual planktonic organisms using InstaGene matrix. Pipetting practice. **Assignment 1** - select papers for discussion.

Week 2 (Oct 5, 7) *Lecture*: Molecular methods in marine biology. *Lab*: DNA extraction from animal tissue using DNEasy protocol. *Discussion*: Interpreting agarose gels, paper discussion.

Week 3 (Oct 12, 14) Quiz 1 - interpreting agarose gels. *Lecture:* Polymerase Chain Reaction. *Lab:* PCR, gel electrophoresis. *Discussion*: Interpreting PCR results. PCR troubleshooting strategies. **Assignment 1 is due. Lab notebooks due for a review (not graded).**

Week 4 (Oct 19, 21) Quiz 2 - interpreting PCR results, troubleshooting strategies. *Lecture:* Dideoxy sequencing. *Lab:* PCR purification and quantification. Sample prep for sequencing. Notebook advice. *Discussion*: Formulate research projects, define research groups. TA - arrange for the samples to be sequenced. **Assignment 2** - explain results and propose troubleshooting strategies for each of your PCR samples from Week 3.

Week 5 (Oct 26, 28) Sequences should be back from Eugene. *Lab:* Sequence analysis (using Codon Code Aligner, NCBI Blast tool). Begin work on research projects (DNA extraction). *Discussion:* paper discussion. **Assignment 2 is due. Assignment 3** - initial sequence analysis (chromatogram quality, primer sequence, Blast).

Week 6 (Nov 2, 4) Quiz 3 - sequence analysis. *Lab:* Sequence alignment, using ClustalX and TreeView. Continue work on research projects (PCR). Work on *Discussion:* paper discussion. **Assignment 3 is due. Assignment 4 -** sequence alignment.

Week 7 (Nov 9, 11) *Lecture:* Phylogenetic analysis using parsimony. *Lab:* Using PAUP. Continue working on projects (PCR troubleshooting, clean up). *Discussion:* paper discussion. **Assignment 4 is due. Assignment 5** - phylogenetic analysis.

Week 8 (Nov 16, 18) Quiz 4 - phylogenetic analysis. *Lecture:* Analysis of protein coding sequences. *Lab:* Continue work on projects (sample prep for sequencing). **Assignment 5 is due.** *Discussion:* paper discussion.

Week 9 (Nov 23) Quiz 5 - protein coding sequences. *Lab:* Continue work on projects (sequence analysis, writing final paper). *No discussion:* THANKSGIVING BREAK.

Week 10 (Nov 30, Dec 2) *Lab:* Archive project samples and data, work on final paper. Lab clean up. *Friday:* **Project presentations** (15 min each)**.**

Week 11 (Dec 7) Project papers and notebooks are due Dec 7.

Assessment and Grading:

Homework assignments 25%	97-100 A+
Queezes 25%	93-96.9 A
Lab notebook 10%	90-92.9 A-
Participation in class and research project 10%	87-89.9 B+
Participation in paper discussions 10%	83-86.9 B
Project final presentation (group graded) 10%	80-82.9 B-
Project final paper (group graded) 10%	77-79.9 C+
	73-76.9 C
	70-72.9 C-
	67-69.9 D+
	63-66.9 D
	60-62.9 D-
	<59.9 = F

Examples of past research projects:

1. Genetic identification of marine invertebrate larvae from Coos Bay plankton.
2. Intraspecific variation of mitochondrial gene sequences (COI and 16S) in two Pacific coast populations of a ribbon worm *Micrura alaskensis* (Phylum Nemertea) with a long-lived planktonic larva.
3. Intraspecific variation of mitochondrial gene sequences (COI and 16S) in two Pacific coast populations of a ribbon worm *Paranemertes peregrina* (Phylum Nemertea) with a short-lived planktonic larva.
4. Intraspecific variation of mitochondrial gene sequences (COI and 16S) in two Oregon coast populations of marine gastropod *Tegula funebralis* (Phylum Mollusca) – assessing patterns of dispersal.
5. Intraspecific variation of 16S rDNA sequences in NE Pacific populations of he jellyfish *Polyorchis penicillatus*.

According to UO Graduate School rules issued in summer 09, the GTF has the following limitations and opportunities. **The Marine Molecular Biology BI 457/557 will adhere to these policies:**

GTFs may not be involved in any aspect of the evaluation of graduate students. More specifically, they are prohibited from:

o Evaluating graduate student work.
o Teaching classes to graduate students.
o Organizing and facilitating discussion sections in which other graduate students participate.
o Entering grades for graduate students.

GTFs assigned to graduate-level courses are permitted to:

o Answer questions that clarify the structure of class assignments.
o Organize assigning students to project work groups.
o Provide an initial review of email messages, forwarding any questions about the academic content of the course to the instructor. They may answer administrative questions.
o Handle and monitor paper submission and return (as long as grades are not visible).
o Be the first source of information for students about deadlines, format requirements, and any non-content issues.
o Monitor, but not participate in, Blackboard discussions in a manner that does not involve evaluating academic content of conversations.
o Monitor attendance.
o Participate in other classroom management duties that do not involve the academic content of the course or evaluations of student mastery of that content.