BZ 460 Genome Evolution
Spring 2018
CRN 24715/24716
Daniel Sloan and Rachel Mueller

SYLLABUS

Meeting Times
11:00am-12:15pm MW; 11:00-11:50am F
Biology Building. Rm 133

Instructors
Daniel Sloan; 491-2256; dan.sloan@colostate.edu; Office hours: 10-11am MW or by appointment*, Bio 438.

Rachel Mueller; 491-6717; rlm@colostate.edu; Office hours: 12:30-1:30pm MW or by appointment*, Bio 434.

*To make an appointment at a time other than office hours, send an e-mail to one of the instructors with multiple options for when you can meet.

Course Description
The goal of this course is to investigate the evolutionary mechanisms that act at the level of macromolecules such as DNA, RNA, and proteins and try to answer the following question: What are the forces that create and maintain the staggering diversity in genome size, structure, and functional organization that exists across the tree of life?

Learning Goals
After taking this course, students should be able to…

- effectively communicate complex concepts related to molecular evolution in both written and oral format.
- read and interpret scientific research papers from the primary literature.
- understand and explain what types of DNA/protein sequence data sets are presently available and how they are generated with modern biotechnologies.
- formulate and test hypotheses about the evolutionary forces that create and maintain diversity in the physical size, structure, and functional organization of genomes across the tree of life.
- distinguish between the effects of adaptive and non-adaptive processes in evolution.
Course Content
The course will be divided into the following modules:
1. Origins of genomes and genetic systems (weeks 1-5)
2. Mechanisms of genome evolution (weeks 6-13)
3. Consequences of genomic change (weeks 14-15)

Week | Topic | Instructor
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Week 1 (Jan 17) | Introduction | Sloan
Week 2 (Jan 22) | Molecular Biology and the Origins of Life | Sloan
Week 3 (Jan 29) | Endosymbiosis and the Origins of Eukaryotic Genomes | Sloan
Week 4 (Feb 5) | Genome Acquisition and Evolutionary Diversification | Sloan
Week 5 (Feb 12) | Co-Evolving Genomes and Intra-Genomic Conflict | Sloan
Week 6 (Feb 19) | Mutation and Mutation Rates | Sloan
Week 7 (Feb 26) | Selection, Drift, and the Origins of Genomic Complexity | Sloan
Week 8 (Mar 5) | Review and Midterm Prep | Sloan
**SPRING BREAK**
Week 9 (Mar 19) | Transposable Elements I | Mueller
Week 10 (Mar 26) | Transposable Elements II | Mueller
Week 11 (Apr 2) | Polyploidy | Mueller
Week 12 (Apr 9) | Gene Duplication and Gene Origins | Mueller
Week 13 (Apr 16) | Genome Size | Mueller
Week 14 (Apr 23) | Populations and Speciation | Mueller
Week 15 (April 30) | Human Genomic Biology | Mueller
Final Exam (May 9)

Canvas
Course information, reading materials, and assignments will be distributed via Canvas (http://canvas.colostate.edu/)

Reading Materials
There is no required textbook for this course. Class discussions and course works will be based largely on assigned review papers and readings from the primary literature. Reading materials will be posted in advance on the course’s Canvas site.

Class Discussion and Attendance Policy
A major focus of this course will be in-class discussion, so each student’s attendance and participation is important for the experience of the entire class. Therefore, attendance is required and will be reflected in your participation grade. Students who anticipate missing a class because of a valid excuse should notify the instructor in advance of the absence. To generate productive discussions, it is important that students have completed reading assignments and related exercises. However, students are still encouraged to attend class and participate as much as possible even if they have not had time to complete the relevant assignments for that day. Up to two times in the
semester (once in each half), students can be excused for not having completed assigned readings without it affecting their participation grade for that day. To take advantage of this policy, students should inform the instructor at the beginning of class that they did not have time to complete the reading that day. The student does not need to provide a reason. The purpose of this policy is to incentivize students to attend class and contribute to discussion even on days when they did not have adequate time to prepare.

**Assignments:**

- **Exams.** The course will include two exams – a midterm to be completed the week before spring break and a final on Wed, May 9 4:10-6:10pm. These exams will be open-notes. A list of multiple long-answer questions will be provided in advance, and each exam will consist of a sample of these questions.
- **Weekly written assignments and exercises.** During most weeks, there will be graded assignments to be done at home and/or in-class. These will include short writing assignments (e.g., response questions related to assigned readings, synthesis questions related to lecture material) and exercises in data analysis, interpretation, and presentation.
- **Lead discussion of scientific paper.** Each student will lead discussion of an assigned scientific paper at one time during the semester. Students will work in pairs to do this and be expected to present a brief summary of the paper and come prepared with questions to stimulate class discussion.
- **Oral presentation.** Each student will make a brief oral presentation that summarizes a scientific paper.

**Grading:** Grades will be based on the following breakdown.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Exams (2)</td>
<td>40%</td>
</tr>
<tr>
<td>Class participation and discussion</td>
<td>20%</td>
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<tr>
<td>Take-home and in-class exercises and written assignments</td>
<td>15%</td>
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<tr>
<td>Short oral presentation on a scientific paper</td>
<td>15%</td>
</tr>
<tr>
<td>Leading class discussion of a scientific paper</td>
<td>10%</td>
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Final Grades will be assigned according to the following scale:

- 97-100: A+
- 93-96: A
- 90-92: A-
- 87-89: B+
- 83-86: B
- 80-82: B-
- 77-79: C+
- 70-76: C
- 60-69: D
- 0-59: F
**Academic Integrity**

Science is driven by making connections between ideas and concepts from diverse sources. Thus, it is natural that you will rely on various sources (including published literature and informal online resources) when preparing assignments for this course. However, it is essential that the ideas in your scientific writing be put into your own words and that proper attribution is given to any source that helped in developing those ideas. In general, you should adhere to the following principles:

1. Your work should be your own.
2. Writing should be put in your own words and never copied verbatim from another source unless it is being quoted directly.
3. Sources that provide concepts, facts, or inspiration for your writing should be properly cited/acknowledged. This is true even for sources that are not formally published (e.g., online resources like Wikipedia).

This course will adhere to the CSU Academic Integrity Policy as found on the Student Responsibilities page of the CSU General Catalog and in the Student Conduct Code.

[http://catalog.colostate.edu/general-catalog/policies/students-responsibilities/#academic-integrity](http://catalog.colostate.edu/general-catalog/policies/students-responsibilities/#academic-integrity)

[https://resolutioncenter.colostate.edu/conduct-code/](https://resolutioncenter.colostate.edu/conduct-code/)

At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.