Course Directors
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Course Schedule
MCB 10 week elective course (3 credits)
Offered every other spring
Tuesday and Thursdays 1:30-3pm in B1-072/074
Course size limited to 15 students

Course Overview
An understanding of evolutionary processes is becoming increasingly important in biomedical research. The purpose of this course is to introduce graduate students with backgrounds in molecular, cellular, and developmental biology to evolutionary approaches. A combination of lectures, workshops, discussions of primary literature, and “hands-on” projects to provide training in comparative and genomic approaches will be used during the course.

Learning Goals and Objectives
1. Introduce classic concepts and modern approaches in evolutionary genetics
2. Familiarize students with evolutionary and genomic approaches, tools and resources
3. Demonstrate how these evolutionary approaches and modern genomic tools can be brought to bear on important biological questions

Curriculum Content
Week 1: Introduction to population genetics
lecture
Week 2-4: Alignments and phylogenetics, Detecting selection
lectures, workshops, projects, paper discussions
Week 5: Comparative genomics
lecture, workshop, project, paper discussion
Week 6: Genotype-phenotype mapping
lecture, paper discussion
Week 7: Genome evolution
lecture, paper discussion
Week 8: Human genetics and evolution
lecture, paper discussion
Week 9: Evolution and cancer
lecture, paper discussion
Week 10: Evolution of infectious disease
lecture, paper discussion
Evaluation and Grading

Class participation (10%)
Students are expected to contribute questions, answers and ideas during lectures, workshops, and paper discussions.

Assignments (10%)
Students must turn in a 1 to 2-page summary of the papers read for in-class discussion at the beginning of the class. Summaries should include (1) major question addressed by paper; (2) approaches used; (3) results; (4) conclusions; and (5) suggestions for future research directions.

Projects (60%)
The first five projects will be based on data provided by the instructors. For the sixth project, students will be asked to choose their favorite gene and use the methods learned in the course to look for molecular signatures of selection within that gene and to perform a comparative genomic analysis of that gene. This analysis may provide preliminary data for the final project.

1. BLAST-alignments
2. Building a phylogeny
3. Detecting selection using DnaSP
4. Detecting selection using PAML
5. Comparative genomics with VISTA
6. Evolutionary analysis of your favorite gene

Final project (20%)
Develop a mock grant proposal using the NIH NRSA format. The proposal should be focused on a question that is of interest to you, but incorporate the approaches you have learned in the course to address the question.