9-2014

BIOB 595.01: Special Topics - Advanced Topics in Genetics and Evolution

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BIOB 595: Evolution & Genetics Core Course Fall 2014

Instructors:
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Office hours: by appointment with either professor

Format: mix of lecture and discussion, with emphasis on primary literature

Overview: A primary goal of the OBE core course series is to foster conversance in the fundamental concepts and approaches of a given field. Conversance for this course means the ability to discuss, at an informed but not necessarily expert level, classical and current research in evolution and evolutionary genetics. This is obviously a large task, as a single topic such as speciation or sexual selection could take up an entire semester. We will begin by walking through the foundation concepts of population and quantitative genetics (aka ecological genetics) in the pre-genomic era, then move on to the use of molecular data to investigate short and long-term evolution (population genomics and phylogenetics), and then explore case studies using these concepts and methods to address long-standing questions in evolutionary biology. We will necessarily operate at a variety of levels, with the aim of providing both novice and advanced students the opportunity to enhance their knowledge and skills.

Learning Outcomes - This course will provide a foundational understanding of the key conceptual issues in Evolutionary Biology and Evolutionary Genetics. It will cover fundamental concepts and approaches, both classic and contemporary, while providing you with a basic entrée into the primary literature. A basic fluency in Evolution and Genetics will allow you to: 1) appreciate and evaluate major advances, challenges and opportunities in this area; 2) interact with a broad range of scientists (from visiting speakers to new collaborators); and 3) broaden your own research scope/approach if you desire to integrate this discipline into your work.

Assessment and grading: We will evaluate (and hopefully, educate) students with three kinds of assignments.

1. Precises (short critical write-ups) of primary literature (15%). Preparedness and full participation are key to the success of our discussions. To foster critical reading skills *to be used even when not handing in an assignment*, students will complete five (5) précises of assigned primary literature. To facilitate timely feedback, the first one will be completed by everyone on the same paper (most likely in Week 3), but the remaining four précis articles will be chosen by the student from among those assigned.

2. Integrative exams (40%). There will be two (2) open-book/take-home exams similar in format to comprehensive exam questions (3 days each, choice of questions). We emphasize that this course is not intended to be a direct preparation for comps; every committee is unique, and some students will get no evolution or genetics questions at all at their comps and others will be tested at a much higher level. However, integrative exam questions will be designed to test the kinds of fundamental knowledge and synthetic/critical thinking skills that comps question are likely to also demand. These exams will be scheduled for ~Week 7-8 and Week 12-14, so will span the 3 topic areas.

3. Final project (30%). "Nothing in biology makes sense except in the light of evolution" (Dobzhansky 1973), so we will ask students to make sense of some aspect of their own thesis research/organism from an evolutionary perspective. This project will be in the form of a research proposal, but will be a 15-20 minute oral presentation rather than a written document. The presentations will be during finals week (more info when we get closer)

In addition to the above assignments, students will be evaluated on participation (15%), evaluated through contribution to the discussion. Attendance will not be formally monitored, but engagement is expected.

Additional Details on Grading
Participation and precises will be graded according to category: - = 70%, √ = 85% and + = 100%, whereas exams and research presentation will be graded on a linear scale (0-100%).

Course and University Policies:

Disability - Students with disabilities may request reasonable modifications by contacting either instructor. The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. "Reasonable" means the University permits no fundamental alterations of academic standards or retroactive modifications.

Academic misconduct - All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code: (http://www.umt.edu/vpsa/policies/student_conduct.php).

Evolution & Genetics Core Course ***Fall 2014***

	Date	Topic	Leader
M	25 Aug	Introduction and organization	F/E
		Ecological and quantitative genetics	
W	27 Aug	Mendelian genetics	F
M	1 Sept	*No Class – Labor Day*	
W	3 Sept	Overview of the 4 "forces"	F
M	8 Sept	Integrating the 4 forces	F
W	10 Sept	Phenotypic variation – within populations	F
M	15 Sept	Phenotypic variation – among populations	F
W	17 Sept	Genotype-phenotype mapping	F
M	22 Sept	Genetic Correlations	F
W	24 Sept	Plasticity & GxE	E
		Using molecular data to study evolution	
M	29 Sept	Neutral theory	G
W	1 Oct	Drift/Coalescent	G
M	6 Oct	Molecular popgen – Intro	G
W	8 Oct	Molecular popgen – detecting selection	F
M	13 Oct	Molecular evolution - Introduction	E
W	15 Oct	Molecular evolution - detecting selection	F
M	20 Oct	Phylogenetics - molecular clocks	E
W	22 Oct	Phylogenetics – trait evolution	E
M	27 Oct	Phylogeny estimation	guest
W	29 Oct	Phylogeny estimation (exercise)	guest
		Evolutionary genetics and genomics – case studies	
M	3 Nov	Sexual Selection and Mating Systems	E
W	5 Nov	Sexual Selection	E
M	10 Nov	Sexual selection	E
W	12 Nov	Speciation – overview	F/E
M	17 Nov	Speciation - mechanisms	F
W	19 Nov	Adaptation – parallel evolution?	F
M	24 Nov	Adaptation – clines?	F
W	26 Nov	*No class – Travel day*	
M	1 Dec	Adaptation – transcriptomics?	E
W	3 Dec	EvoDevo	E

Week of Dec 8th - Final Presentations