Fall 9-1-2020

BIOB 505.B01: OBE Core Course - Graduate Ecology and Evolution Core

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Graduate Ecology and Evolution Core – (BIOB 505-01, Fall 2020)

Location

- Hyflex Modality, face-to-face lectures combined with remote discussion sessions.
- Lecture - Tuesday/Thursday 8:40-10:00, Health Sciences 207
- Discussion (1 hr weekly)- Thursday, 5:00-6:00, remote with Zoom link available on Moodle.
- When possible, all classes will be recorded (audio only for whiteboard lectures) and posted on Moodle.

Instructors

- Jeff Good (he/him/his), jeffrey.good@umontana.edu
- Interdisciplinary Sciences Building 307
- Office hours: Zoom by appointment, unless by prior arrangement

- John Maron (he/him/his), john.maron@mso.umt.edu
- Natural Sciences Annex 102
- Office hours: Zoom by appointment, unless by prior arrangement

- Bret Tobalske (he/him/his), bret.tobalske@mso.umt.edu
- Health Sciences 207
- Office hours: Zoom by appointment, unless by prior arrangement

Materials

- Class website on Moodle - https://moodle.umt.edu, **Required readings will be provided as pdf files on the course Moodle site.**
- Textbook: A textbook is NOT required for this course. That said, here are some recommended reference texts that cover many of the core topics of this class and might be useful for this course and beyond, especially for students of genetics and evolution. Cutter (~$50 Amazon) and Baum & Smith (~$30 Amazon) provide lucid and concise introductions to populations genetics and phylogenetics, respectively. Again, not required but these texts could be helpful references.
- Cutter, A.D. 2019. A Primer of Molecular Population Genetics. Oxford Univ Press.
- Baum, D.A., S. D. Smith. 2013. Tree Thinking: An Introduction to Phylogenetic Biology. W. H. Freeman

Some other general references:

- Hahn, M.W. 2018. Molecular Population Genetics. Sinauer Associates. Sunderland MA. Controversial in places, but also an accessible and compelling text coverage of some topics.
- Hartl, D.L. and A.G. Clark. 2007. Principles of Population Genetics. Sinauer Associates. Sunderland MA. (4th addition, older additions have good coverage of core topics as well – other general population genetics text would provide similar background as well)
- 3. Graur, D. and W-H. Li 2000. Fundamentals of Molecular Evolution. Sinauer Associates. Sunderland MA. (Graur also has a newer version - Molecular & Genome Evolution 2016 - which includes an updated of more genomic-scale topics.)

COVID-19 Health Guidelines

- Adopted from general UM policy (see www.umt.edu/umonline/keep_on_teaching/)
- Mask use is required within the classroom.
- Each student is provided with a cleaning kit. The expectation is that students will clean their personal workspace when they arrive for class, and before they leave the classroom.
- Health Sciences 207 has one-way entrance/exit to minimize crowding.
- Students are discouraged from congregating outside the classroom before and after class.
- Specific seating arrangements will be used to ensure social distancing and support contact tracing efforts.
- Class attendance will be recorded to support contact tracing efforts.
- Drinking liquids and eating food is discouraged within the classroom (which requires mask removal).
- Audio from classes will be recorded and posted on Moodle. Some instruction will be via whiteboard so audio recordings are not a replacement for in-class attendance.
- Stay home if you feel sick or are exhibiting any COVID-19 symptoms.
- Students that are sick or displaying symptoms, please contact the Curry Health Center at **(406) 243-4330.**
- We are all in this together! Please let me know if you have any concerns with related to these guidelines or any other aspect of how this course is delivered.

Introduction

A primary goal of the OBEE core course series is to foster conversance in the fundamental concepts and approaches of a given field. Historically this was divided into three semester-long courses on (1) Genetics & Evolution, (2) Ecology, and (3) Organismal Form & Function. We are now condensing this sequence into two semesters, merging aspects of each together into a narrative that spans core topics in ecology, evolution, and organismal biology. Conversance for this course means the ability to discuss, at an informed but not necessarily expert level, classical and current research in several major subdisciplines of evolutionary biology, population biology, phylogenetics, and evolutionary genetics.

We will begin by walking through the foundation concepts of evolutionary models and basic population genetics. We will then transition to thinking about natural selection and adaptation, from both population genetic and trait-based quantitative genetic perspectives. We will then move on to investigate long-term evolution (phylogenetics) with an emphasis on trait-based evolution (evolutionary physiology, multi-trait evolution). We will explore the forefront of research into the processes speciation at different scales, which essentially merges population genetics and phylogenetics. Finally, we will introduce ecological-based population models and contrast these with evolutionary (population genetic) models. The goal is to emphasize the similarities and differences between these two complementary approaches to understanding the biology of populations. 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

1. Provide a foundational understanding of the key conceptual issues in Evolutionary Biology, Population Biology, and Evolutionary Genetics.
2. Cover fundamental concepts and approaches, both classic and contemporary, while providing you with a basic entrée into the primary literature.

3. Appreciate and evaluate major advances, challenges and opportunities in Evolution and Genetics;
4. Provide the foundation to Interact with a broad range of scientists (from your cohort to visiting speakers and new collaborators);
5. (Ideally) Broaden the conceptual scope of your own research.

Grading

Exams – 200 points; 40% of total grade; 100 pts for each of 2 exams
Final project – 150 points; 30% of total grade
Participation – 150 points; 30% of total grade

Grading Scale A [500 - 450 pts], B [449 - 400], C [399 - 350], D [349 - 300], F [< 299])
Plus/minus grades may be assigned.

Exams(40%): There will be two (2) open-book/take-home exams. Questions on these exams will be similar in format to those on the written component of OBEE comprehensive exams. However, 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, 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 Finals week, and will roughly divide the course content. Further details of exam format will be given during the week prior to the exam.

Final project (30%): "Nothing in biology makes sense except in the light of evolution" (Dobzhansky 1973), so we will ask you 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 delivered as a ~15 minute oral presentation rather than a written document. The presentations will be during the final week of class (more info when we get closer).

Participation (30%): The final component of your grade will be based on various aspects of class participation. First, the course is structured to alternate formal lectures with discussions of both classic and contemporary literature (see lecture schedule on Moodle). These literature discussions will be student led and each of you will be assigned one discussion to lead. Given the current enrollment, each of you will lead a single discussion with a few sessions used for general topics led by the instructor. While leading these discussions, you will first give a brief overview (~15 min.) the paper and the topic it addresses, and then you will facilitate the following discussion by presenting targeted discussion questions to the class. Half of your participation points will be based on the quality of your paper overview and your ability to facilitate the discussion. We will provide written guidance on leading discussion to help you prepare. The second half of your participation points will come from your participation (and attendance) in the discussions you are not personally leading. When you are not leading the discussion, you will be required to submit via moodle a concise statement 24 hours before the scheduled discussion that includes 1.) an aspect of the paper you found confusing or unclear, and 2.) a brief critique or suggestion for improvement of the study. We will collate these responses and given them to the discussion leader to aid in guiding the discussion. Because discussions only work when people actually speak, you will also have the opportunity to earn points through your verbal participation in the class discussions.

Miscellaneous information

- **Students with disabilities -** The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you have a disability that adversely affects your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or 406.243.2243. We will work with you and Disability Services to provide an appropriate modification.

- **Late work policy** - This class will cover a lot of ground, and will require you to keep up with the assigned reading. If you have a problem understanding the material, or with turning an assignment in on time, we strongly encourage you to contact us as early as possible. In general, we will not accept *severely* late work, but are sympathetic and reasonable if you deal with us in an upfront and honest manner. Please do not wait until the last minute to explain your situation.

- **Academic misconduct** will be reported and handled as described in the University of Montana Student Conduct Code. 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. The work you turn in should be your own. If we see any evidence of a student copying or other forms of plagiarism we will treat the matter extremely harshly. This may include receiving a failing grade for the entire course and filing a report with the Provost & Vice President for Academic Affairs. We don't expect this to be an issue with this course, but we do want you to know that I take plagiarism very seriously. If you are unsure about any of this, we urge you to just ask us before turning something in. The plagiarism diagram on the course Moodle page might be helpful if you are unsure.

- **Student Behavior**: When in class students are expected to behave in a manner that is respectful of others. If you prefer, you may use laptops or tablets to take notes during lecture – please be respectful of others when doing so.