BIOL 60.02: Evolution of Sex

Prerequisite: Biol 15 and at least one from 21, 24, 27, 28, 32, 37, 47 or permission from instructor
Schedule: 11A (TTh)
Location: TBD
Instructor: Ryan Calsbeek
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603-646-9917

Office Hours: Tuesday 1-2 and Friday 3-4 or by appointment (LSC 338). Please try to schedule an appointment in advance by email (rather than just dropping in) and I will make every effort to accommodate these requests if you cannot make it to my regular office hours.

Brief Course Description: Despite the many benefits of asexual reproduction, the vast majority of eukaryotes reproduce sexually. How sex evolved, and how it persists despite its many associated costs, are major unanswered questions in evolutionary biology. We will explore the diversity of sexual reproduction and related evolutionary phenomena with a focus on critically evaluating current research and theory in this area.

Course Expectations: All students are expected to participate actively in class. Each class will consist of an interactive lecture and discussion. On most days, a reading from the primary literature (with an emphasis on new findings from current research) will serve as a template for further discussion. All students are expected to have carefully read these papers and submitted answers to the associated questions prior to class. All students will be responsible for the content of these papers, questions, and the ensuing in-class discussion as potential material on exams.

Graduate Students: In lieu of the group presentation and final exam, graduate students will prepare a brief review or perspective article in the style of a scientific publication on a topic of their choice. Emphasis will be placed on identifying a novel problem, developing a new hypothesis, making new connections among ideas, gathering literature data that could potentially address an unstudied aspect of the topics discussed in class, or synthesizing an area that currently lacks such synthesis. Grad students are encouraged (but not required) to generate ideas that could lead to actual submission and publication, even if this occurs after the course is completed.

Grading:	Two in-class exams	50%	(25% each)	200 points total
	Questions from assigned readings	10%		40 points total
	Group presentations	10%		40 points total
	Comprehensive final exam	30%		120 points total

Exams will consist of multiple choice, problem solving, and short answer. All exam material will be covered in class and will include aspects of the in-class lectures and the reading assignments.

Each student must submit (via Canvas) their answers to the questions from each assigned reading (in **bold** on the schedule below and provided as PDF files on Canvas) before the start of the corresponding class. Assignments are due at 12:30 pm. Late submissions will not be accepted. Incomplete assignments and those with multiple incorrect answers will receive partial or no credit. We will discuss the answers to these questions in class. The group presentation assignment will be discussed in class and details will be provided on CANVAS.

Exam Times and Locations: All exams will be conducted during usual class meeting times (Tuesdays and Thursdays, 10:10-12) in LSC **TBD**.

Make-up Exams: No make-up exams will be allowed without prior written arrangement, except in the event of extreme extenuating circumstances. Exams have been scheduled during normal class hours in which you are expected to be in attendance.

Course Materials: No formal text will be required for this course. Articles from the primary literature will be discussed in class. Because a major focus of this class is on emerging research and new findings, these readings may change during any particular semester. All readings will be available as electronic files on the CANVAS site for the course. PowerPoint slides for the lectures will also be made available as study aids and note-taking guides. These slides are not intended as a substitute for attendance, nor will they include all of the material (or detail) we will cover in class. Every effort will be made to post these slides online prior to lectures, but this may not always be possible, so you should come prepared to follow the lecture discussion with or without these materials. All course materials that are posted online are intended for the personal use of students enrolled in BIOL 60.02 and are not to be posted online elsewhere, or otherwise made available to persons outside of this course.

Recording Policy: You may make audio recordings of lectures solely for personal use. You may not post audio recordings on any internet site. Video recording of lectures and discussions are not allowed under any circumstances.

Academic Integrity: Expected at all times. Placing your name on all assignments and tests affirms that you have neither received nor given aid in completing the assignment or test and, especially in the case of written assignments, have acknowledged properly the scholarship of others. All students are expected to comply with the provisions in the Dartmouth Honor System.

Schedule of Topics and Associated Readings: The following is an outline of planned lectures and topics for Winter 2018. The content and order of these lectures are subject to change slightly at the discretion of the instructor. In such cases, announcements will be made in class and posted on the Canvas website. Readings for each lecture **(in bold below)** and the associated questions for assignments will also be posted on Canvas.

Date Topic
Introduction: Why study the evolution of sex?
1. Evolution of Sex, Anisogamy, and Meiosis
2. The Paradox of Sex **(Goddard et al. 2005)**
3. Benefits of Sex I: The Red Queen and the Tangled Bank **(Morran et al. 2011)**
4. Benefits of Sex II: Muller's Ratchet and Kondrashov's Hatchet **(Paland & Lynch 2006)**
5. Pluralism and Life Without Sex I: Ancient Asexuals **(Mark Welch & Meselson 2000)**
6. Life Without Sex II: An Evolutionary Dead-End? **(Wilson & Sherman 2010)**
7. Sex and Death: Costs of Reproduction **(Moore & Wilson 2002)**
7. Sexual Selection I: Theory and Background **(Rodriguez-Munoz et al. 2010)**
8. Sexual Selection II: Mate Choice and the Lek Paradox **(Byers & Waits 2006)**
10. Sexual Selection III: Sex Roles and Sex-role Reversal **(Clutton-Brock et al. 2006)**
Overview of Part 1, Review for Exam 1
EXAM 1 covering lectures 1-10
11. Post-copulatory Sexual Selection I: Sperm Competition **(den Boer et al. 2010)**
12. Post-copulatory Sexual Selection II: Cryptic Female Choice **(Pryke et al. 2010)**
13. Inter-locus Sexual Conflict I: Battle of the Sexes **(Stutt & Siva-Jothy 2003)**
14. Inter-locus Sexual Conflict II: Arms Races and Coevolution **(Khila et al. 2012)**
15. Variation Within Sexes: Alternative Reproductive Tactics **(Rowland & Emlen 2009)**
16. Variation Between Sexes: Sexual Dimorphism **(Kijimoto et al. 2012)**
17. Intra-locus Sexual Conflict: Two Sexes, One Genome **(Pischedda & Chippindale 2006)**
18. Sex Determination and Sexual Differentiation **(Warner & Shine 2008)**
19. Sex Allocation and Sex-Ratio Evolution **(Pryke & Griffith 2009)**
20. Sex Drive, Dead-End Males, and Selfish Genes **(Price et al. 2008)**
Overview of part 2, Review for Exam 2
EXAM 2 covering lectures 11-20
Group presentation workshop
Group presentations (TBD)
Group presentations (TBD)
Group presentations (if needed) and overview of course material
CUMULATIVE FINAL EXAM