Evolutionary Biology (BIOL 5250)
Spring 2018

Class meetings:	BNR 278, 12:00–1:15 pm, Tues. & Thurs.	
Website:	Canvas	
	Instructor	Teaching Assistant
	Dr. Zach Gompert	Mal Hagadorn
Email:	zach.gompert@usu.edu	mahagadorn@aggiemail.usu.edu
Office:	BNR 355	BNR 301
Office Hours:	Tues. 1:15-2:30 pm	TBA
	by appointment	

1 Description of the Course and Learning Objectives

In this course we will get an overview of modern evolutionary biology, with a focus on the process of science. A good understanding of the processes and mechanisms of evolution will be our primary goal. By the end of the course you should be able to (1) make predictions and generate testable hypotheses based your understanding of the evolutionary process, (2) apply evolutionary thinking to real-world problems, and (3) respond to major misconceptions regarding evolution. Along these lines, this course is designed to address the following IDEA learning objective:

- learning fundamental principles, generalizations, or theories
- learning to apply course material in problem solving, and decision making
- learning to analyze and critically evaluate ideas, arguments, and hypotheses

Although this is an introductory course in evolutionary biology, it is not purely a lecture-based course. I will offer lectures, explanations and examples to introduce and clarify material, but we will also discuss material and perform hands-on activities in small groups and as a class. This format may be unfamiliar at first and will require that all of us come prepared to each class. Part of my job will be to make clear what the preparation for each class entails. It should be clear from the outset that this course is built around your regular, active preparation for class meetings.

2 Course Materials

1. J. C. Herron and S. Freeman. 2014. *Evolutionary Analysis*. Fifth Edition. Pearson Prentice Hall, NJ.
2. Articles from scientific journals (available via Canvas)

3 Attendance and Participation

Learning in class is a communal endeavor as well as an individual undertaking. You are expected to be present and prepared at the designated time for every class and to remain engaged in class activities throughout the time allotted for class. Coming to class prepared includes reading book chapters and selections from the primary literature and completing all assignments.

4 Assessment

Your performance will be evaluated based on three exams, three analytical exercises, six reading assignments (think pieces), and a series of reading quizzes. These assignments are introduced below, but additional information regarding the exams and analytical exercises will be provided in due course. Due dates for all assignments can be found on Canvas. Unless prior arrangements are made with me (that is, before an assignment is due), **late work will not be accepted**.

Reading quizzes	10%
Think pieces	20%
Analytical exercises	20%
Exams	50%

Letter grades will be calculated on the standard USU scale:
A = 93 − 100, A– = 90 − 92, B+ = 87 − 89, B = 83 − 86, B– = 80 − 82, C+ = 77 − 79, C = 73 − 76, C– = 70 − 72, D+ = 67 − 69, D = 60 − 66, and F < 60. Your final score will be **rounded downward** to the nearest integer value when assigning letter grades. In other words, a 79.9 is a C+ not a B–.

4.1 Reading quizzes (10%)

Reading the text book will provide a broad introduction to key concepts in evolutionary biology. By keeping up with the reading outside of class, we will be able to focus on more difficult concepts and applications of the material in class. There will be a short (2-6 questions) reading quiz for each assigned chapter (it may cover all or part of the chapter, see Canvas for details). You can take the reading quizzes on-line via Canvas. These reading quizzes are meant to provide you with immediate feedback on your grasp of the material, and to help me identify and target topics that many students struggle with.

4.2 Think pieces (20%)

As biologists you will need to read and analyze scientific papers. Thus, as part of this course you will read, analyze (in writing), and discuss six scientific papers. The written component that is associated with and responds to each assigned reading is called a think-piece, and constitutes the primary CI (communication intensive) component of this course. Think-pieces should contain discussion, critical analysis, and reasoned opinion, as opposed to a simple factual summary. Think-pieces should address the key concepts in the paper, as well as highlight the most important findings or other aspects of the reading, and make

connections between the journal article and the material we have discussed in class. An additional purpose of the think-pieces is to give you an opportunity to summarize your thoughts, responses, and questions after reading the materials and in preparation for in-class discussion. Think-pieces should be word processed and approximately one page long. Each think piece is worth 10 points (see the rubric on Canvas for details). During class you will be given questions or prompts associated with the scientific papers to discuss in small groups.

4.3 Analytical exercises (20%)

Scientists develop hypotheses, design and conduct experiments, and analyze and interpret data. As part of this course, you will complete three analytical exercises that will help you develop these skills and delve deeper into important topics in evolutionary biology. In these exercises you will work in groups to conduct computer-based experiments and analyze and interpret scientific data. You will then be asked to respond to write a short report. I will provide detailed instructions and expectations for each analytical exercise in due course. A substantial portion of this work will be done in class, but you will often need out of class time to complete these assignments.

4.4 Exams (50%)

There will be two standard exams (100 points each) and a final exam (120 points). Thus, the final exam counts more (37.5%) than the individual standard exams (31.25% each) toward your total score for the exams. The exams will be administered via Canvas, timed, and will include 30-40 multiple choice or fill in the blank questions, as well as a few long-answer or essay questions. The long-answer/essay questions will require quantitative and qualitative analyses, application of knowledge to problems, and synthesis or ideas. In general, my hope is that the exams will require you to think rather than to simply memorize terms and concepts, and will, to the extent possible, emphasize the process of science. You are not permitted to use notes or your book on the exams. The exams will require arithmetic; you are invited to use a calculator.

5 Schedule of Topics

The course is organized into three main sections, each focused on a major topic in evolutionary biology and each ending with an exam. We will learn about the key questions, approaches, and major findings associated with each major topic through lectures and in-class discussions, by reading the text book (and taking the associated reading quizzes), by engaging in analytical exercises, and by reading, summarizing and discussing articles from the primary literature. Below you will find a schedule with the topics and activities for each week (topics that might be omitted if time is short are denoted with an *). See Canvas for assignment due dates.

Date	Topics and Activities
Natural Selection and Adaptation	
9, 11 Jan.	Patterns of evolution; Relevance of evolution
16, 18 Jan.	Defining and measuring selection and adaptation
23, 25 Jan.	Dynamics and outcomes of evolution by selection; Begin Avida experiments
30 Jan., 1 Feb.	Avida experiments cont.; Eco-evolutionary dynamics; Adaptation and trade-offs
6, 8 Feb.	Evolution of sex*; Exam 1
Molecular Evolution	
13, 15 Feb.	Genetic and phenotypic variation; Neutral theory
22 Feb.	Genetic drift and neutral theory cont.
27 Feb., 1 Mar.	Using population genetic simulations to understand evolution
13, 15 Mar.	Genomic consequences of selection; Measuring selection at the molecular level; Is (molecular) evolution predictable?
20, 22 Mar.	Evolution of genome architecture*; Exam 2
Speciation and Macroevolution	
27, 29 Mar.	Origin of species; Evolution of reproductive isolation
3, 5 Apr.	Measuring speciation; Evolution of development/body plans
10, 12 Apr.	Inferring phylogenies; Macroevolutionary patterns and processes; Begin phylogenetic analyses
17, 19 Apr.	Phylogenetic analyses cont.; Big events in the history of life
24, 26 Apr.	Human evolution; Contemporary and cultural evolution*
1 May	Final Exam (Tuesday, May 1st, 11:30 am–1:20 pm);

6 Additional Items

- The schedule of topics, assignments, and all other details in this syllabus are subject to change with fair warning.
- I should be informed of an absence from a scheduled exam in advance and I will accommodate absences for legitimate reasons and administer an exam at another time. If an emergency causes an absence from an exam, please contact me at your earliest convenience.
- ADA compliance: Students with physical, sensory, emotional or medical impairments may be eligible for reasonable accommodations in accordance with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973. All accommodations are coordinated through the Disability Resource Center in Room 101 of the University Inn, 797-2444 voice, 797-0740 TTY, or toll free at 1-800-259-2966. Please contact the DRC as early in the semester as possible. Alternate format materials (Braille, large print or digital) are available with advance notice.
- Sexual harassment is defined by the Affirmative Action/Equal Employment Opportunity Commission as any "unwelcome sexual advances, requests for sexual favors, and

other verbal or physical conduct of a sexual nature." If you feel you are a victim of sexual harassment, you may talk to or file a complaint with the Affirmative Action/Equal Employment Opportunity Office located in Old Main, Room 161, or call the AA/EEO Office at 797-1266.

- Students whose religious activities conflict with the class schedule should contact me at the beginning of the semester to make alternative arrangements.

- Cheating and other forms of academic dishonesty are listed in The Code of Policies and Procedures for Students at Utah State University (revised September 2009), Article VI, Section 1. If you are found to be engaged in academic misconduct, at a minimum you will receive no credit for that exam or assignment. Repeat or serious offenders can expect more serious consequences.

- Many electronic devices are distracting in the classroom, to the user, other students and the instructor. This includes laptops, which clearly can be useful for taking notes but their web access often is a distraction. I ask that students are conscientious about their electronic devices and do their best to keep distractions outside the classroom. The simple guideline is that laptops, tablets, and mobile phones should be used for note-taking and classroom exercises only and not for browsing the internet.