



**USC Dornsife**

Dana and David Dornsife  
College of Letters, Arts and Sciences

**BISC 313Lxg: Evolution and Population Genetics**

**4 units**

**Spring 2024—Mon/Wed/Fri— 11:00 - 11:50 am**

**Lecture hall: ZHS 163.**

**Instructor: Dr. Trond Sigurdson**

**Office: AHF 139**

**Office Hours: Announced in lecture**

**Contact Info: Email: [sigurdse@usc.edu](mailto:sigurdse@usc.edu)**

**Laboratory Times and Location:**

**Thur: 11:00 - 12:50 PM, OR 2-3:50 PM, ZHS 458**

**Recommended Texts:**

- *Evolution*, by Futuyama and Kirkpatrick, 4<sup>th</sup> or 5<sup>th</sup> edition. Sinauer Press
- Other texts will be provided on Blackboard or as printouts

**Course Description:**

Evolution is one of the pillars of modern biology, but the importance of its study is not restricted to biologists. As evolutionary biologist Theodosius Dobzhansky put it so elegantly, in the title of his 1973 essay, “Nothing in biology makes sense except in light of evolution.” The same can be said of human biology and medicine. Training in evolutionary thinking enables biologists to understand biological diversity and how organisms adapt. It can also help biomedical researchers and clinicians to ask useful questions about modern human health and disease that they might not otherwise pose. BISC 313 is an advanced course in evolution, emphasizing not only natural selection but also the population genetic mechanisms. Underlying our current theory of evolution is the theory of genomic science, which is advancing our understanding of evolutionary biology, ecology, and medicine. Understanding evolution is of paramount importance to comprehending the “why” and “how” of nature and modern human variation.

**Learning Objectives:**

The course will use a combination of lecture and laboratory meetings to provide students with an advanced background in the study of evolution. Lecture topics will range from principles of evolution and the history of scientific discovery to contemporary issues of genetics, conservation, and medicine. Laboratories will take the form of learning from simple computer simulations of populations, seminar discussion of papers, and presentations. In the second part of the course, the focus will shift to human evolution. These topics will be paired with laboratory exercises that address the interpretation of the hominid fossil record and the acquisition of complex human behaviors. The human practice of artificial selection will be illustrated by highlighting examples of the domestic animals and plants upon which our society is dependent. Lab meetings will also be devoted to student presentations on the topic of communicating science to the public.

**Prerequisite(s):** BISC 220 or 221, and BISC 120 or 121 (the first-year biology sequence)

**Website:** <https://blackboard.usc.edu>

**Exams:** The lecture portion of this course will include two midterm examinations and a final examination. Both examinations (midterm and final) may include multiple choice questions, fill-in answer, short answers, short essays, definitions, and quantitative problems. The final examination will be cumulative but also weighted towards material covered in the final third of the course.

### **Lab Presentations**

The last two weeks of the semester will be devoted to student presentations on topics of the students' choice related to evolution and genetics and/or phylogenetics. Detailed instructions and guidelines, including deadlines for topic submission, will be posted on Blackboard.

### **Note on absences**

Attendance to both lectures and labs is important. Chronic missed classes will adversely affect your performance. More than two unexcused absences in the lab can result in a failing grade for the lab portion of the course.

### **Grading Timeline**

Grades for Midterm Exams will be posted within one calendar week following the exam date.

### **Grading Breakdown**

<b>Assignment</b>	<b>Points</b>
Midterm 1	30
Midterm 2	30
Oral Presentation Project	30
Laboratory assignments	30
Laboratory participation	30
Final Exam	50
<b>Total</b>	<b>200</b>

Final grades will be determined as a percentage of the highest score.

**Schedule of lecture and lab topics.** *Note that the schedule is subject to change. Any schedule changes will be discussed in class.*

<b>Week</b>	<b>Dates</b>	<b>Lectures</b>	<b>Labs</b>
1	Jan 8- Jan 12	Before Darwin; Aristotle to Lamarck. Darwin, Wallace, and natural selection	<b>No labs</b>
2	Jan 15- Jan 19	<b>MLK Day Monday no lecture.</b> Evolutionary trees, Evol. Synthesis.	Introductory lab
3	Jan 22- Jan 26	Synapomorphy, symplesiomorphy, Adaptations, genetics, Mendel,	Introduction to Simbio: Mendelian Pigs
4	Jan 29- Feb 2	Mutation, mutation rates, genetic disease	Getting used to phylogenetic trees
5	Feb 5- Feb 9	Effect on genetics and phenotype <b>MIDTERM 1 ON FRIDAY 1h</b>	Simbio: Flowers and Trees
6	Feb 12- Feb 16	Genetic drift, neutral theory, molecular clock	Paper assignment.
7	Feb 19- Feb 23	<b>President's Day Monday, no lecture.</b> Gene flow vs genetic drift, coalescence	Simbio: Domesticating Dogs
8	Feb 26- Mar 1	Speciation, allopatric, sympatric etc.	<b>Review for midterm</b>
9	Mar 4- Mar 8	Genes and chromosome mutations, gene expression	Paper: Biodiversity across space and time in the fossil record, speciation
10	Mar 11- Mar 15	<b>Spring Recess, No lectures</b>	<b>No labs</b>
11	Mar 18- Mar 22	Evolution of sex, sexual selection <b>MIDTERM 2 ON FRIDAY 1h</b>	Simbio: How the Guppy Got its Spots
12	Mar 25- Mar 29	Evolution of life histories, aging and genetics	Paper assignment
13	Apr 1- Apr 5	Cooperation and conflict, altruism	Simbio: The HIV Clock
14	Apr 8- Apr 12	Coevolution, mimicry, competition	Student Presentations, Q&A
15	Apr 15- Apr 19	Evolution of genes, pseudogenes, gene expression, epigenetics	Student Presentations, Q&A
16	Apr 22- Apr 26	Phylogenetics, evolution and development, human evolution	Final exam review
	May 1	<b>Final Exam 11am, 1h</b>	

### **Course Policies**

1) Exam dates are firm. There are no makeup exams in the course. Performance on the final may be prorated to substitute for a missing midterm exam, if an excuse considered valid by faculty is presented in a timely fashion. An acceptable written excuse or documentation must be provided to the Instructor.

2) The midterm exams will be graded online by the professor and discussed during lectures. The final examination will not be returned but will be retained for one semester by the faculty.

3) Regrades: If you think an answer you have provided was graded incorrectly or if there is an arithmetic error, you may seek a regrade. You must provide a written explanation of why you think your answer was graded incorrectly. If a regrade is agreed upon, then the ENTIRE EXAMINATION may be subject to a regrade. Your grade may therefore go up, go down, or remain the same. Regrade requests must be received within one week of when the midterm exam is returned to the students, or by the second week of classes the following semester for the final exam.

4) No special assignments for extra credit are permitted.

5) Academic integrity policies of the University will be strictly followed (see below). Infractions can result in severe penalties. There may be assigned seating for exams. No student may be admitted to an exam after the first student has left the exam.

6) It may be necessary to make adjustments to the syllabus during the semester. Check the course website or class announcements on Blackboard for updates.

### **Academic Conduct**

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” [policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

### **Support Systems:**

*Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call*

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.  
[engemannshc.usc.edu/counseling](http://engemannshc.usc.edu/counseling)

*National Suicide Prevention Lifeline – 1 (800) 273-8255*

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. [www.suicidepreventionlifeline.org](http://www.suicidepreventionlifeline.org)

*Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call*

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. [engemannshc.usc.edu/rsvp](http://engemannshc.usc.edu/rsvp)

*Sexual Assault Resource Center*

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: [sarc.usc.edu](http://sarc.usc.edu)

*Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086*

Works with faculty, staff, visitors, applicants, and students around issues of protected class.  
[equity.usc.edu](http://equity.usc.edu)

*Bias Assessment Response and Support*

Incidents of bias, and hate crimes need to be reported allowing for appropriate investigation and response. [studentaffairs.usc.edu/bias-assessment-response-support](http://studentaffairs.usc.edu/bias-assessment-response-support)

*Office of Student Accessibility Services (OSAS)*

Provides certification for students with disabilities and helps arrange relevant accommodations.  
<https://osas.usc.edu/about/contact-location-hours/>

*Student Support and Advocacy – (213) 821-4710*

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. [studentaffairs.usc.edu/ssa](http://studentaffairs.usc.edu/ssa)

*Diversity at USC*

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students.  
[diversity.usc.edu](http://diversity.usc.edu)

*USC Emergency Information*

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. [emergency.usc.edu](http://emergency.usc.edu)

*USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or report a crime.* Provides overall safety to USC community. [dps.usc.edu](http://dps.usc.edu)