



USC Dornsife

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College of Letters, Arts and Sciences

BISC 313Lxg: Evolution and Population Genetics
4 units
Spring 2025—Mon/Wed/Fri— 11:00 - 11:50 am
Lecture hall: ZHS 163.

Instructor: Dr. Trond Sigurdson
Office: AHF 139
Office Hours: TBA
Contact Info: Email: sigurdse@usc.edu

Instructor: Dr. Sergey Nuzhdin
Office: RRI 304C
Office Hours: TBA
Contact Info: Email: snuzhdin@usc.edu

Laboratory Times and Location:
Thursday: 11AM-12:50 OR 2PM-3:50, ZHS 458

Recommended Texts:

- ***Evolution: Making Sense of Life***, by Emlen and Zimmer, 4th or 5th edition. Sinauer Press
- Other texts will be provided on Brightspace 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 conservation, medicine and human biology specifically. Training in evolutionary thinking enables biologists to understand biological diversity and how organisms adapt. It can also help researchers 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 a project involving evolution in marine biology, a visit to the Natural History Museum, seminar discussion of papers, and presentations. A big part of the course will focus on detecting evolution in populations, and presenting the results of our data from marine sea urchin populations in a scientific paper draft. The visit to the museum is designed to give an impression of evolution on a larger scale. Lab meetings will also be devoted to student presentations of their results.

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

Website: [https:// brightspace.usc.edu/](https://brightspace.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 papers and presentations on topics of the students' research related to evolution and genetics in marine biology. Detailed instructions and guidelines, including deadlines for topic submission, will be posted on Brightspace.

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

Assignment	Points
Midterm 1	30
Midterm 2	30
Paper, Presentation Project	30
Laboratory assignments	30
Lab homework/prep	30
Final Exam	50
Total	200

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.*

Week	Dates	Lectures	Labs
1	Jan 13- Jan 17	Before Darwin; Lamarck. Darwin, Wallace, and natural selection (ch.1-2)	No labs
2	Jan 20- Jan 24	MLK Day Monday no lecture. Paleontology, macroevolution (ch. 3)	Introductory lab
3	Jan 27- Jan 31	Phylogenetics: Synapomorphy, symplesiomorphy, adaptations (ch. 3-4)	Evolutionary terminology, phylogenetic trees
4	Feb 3- Feb 7	Genetics basics, genotype, phenotype (ch 5)	Introduction to research topic: evolution of sea urchins
5	Feb10- Feb 14	Natural selection, empirical studies (ch. 10) MIDTERM 1 ON FRIDAY 1h	Review for midterm
6	Feb17- Feb 21	President's Day Monday, no lecture. Speciation, Macroevolution, biogeography (ch.13-14)	Paper assignment: detecting evolution in populations
7	Feb24- Feb 28		Sampling of sea urchin DNA
8	Mar 3- Mar 7	Introduction to human evolution (ch. 17)	Sequencing of sea urchin DNA: how it is done
9	Mar10- Mar14	Genetic drift vs natural selection (ch. 5-6)	Paper: Biodiversity across space and time in the fossil record
10	Mar17- Mar21	Spring Recess, No lectures	No labs
11	Mar24- Mar 28	Quantitative genetics and evolution (ch 7) MIDTERM 2 ON FRIDAY 1h	Review for midterm
12	Mar31- Apr 4	Gene trees, coalescence, neutral evolution (ch. 8)	Visit to NHM, meet curators, assignment
13	Apr7- Apr11	Genetic networks and development (ch.9)	Results of sea urchin experiments. Discussion of genetics/statistics
14	Apr14- Apr18	Sex and evolution (ch. 11)	Paper assignment: tips on writing a publishable paper
15	Apr21- Apr25	Development and genetics (ch. 12)	Student Presentations, Q&A
16	Apr28- May2	Coevolution, symbiosis, parasites, and medicine (ch. 15 & 18)	Review for Final Exam
	May 7	Final Exam 11am, 1h	

Blue: taught by Dr. Sigurdson

Green: taught by Dr. Nuzhdin

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 by the lab instructors and professor and discussed during labs. 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 Brightspace 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. 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

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

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

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

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

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

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

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

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

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