

BIEB 150 Evolution

Lectures M through Th 12:30 pm to 1:50 pm PDT, Peterson 103

Discussion sessions will be in AP&M 2301:

Discussion One A01 M and W 9:00-9:50am

Discussion Two. A02 M and W 10:00-10:50am

The IAs, and their contact information, to be announced shortly

FINAL 09/02/2021 11:30 am to 2:30 pm, place to be announced.

Professor: Christopher Wills, 5256 Muir Biology, cwills@ucsd.edu

Prof's office hours 2:30-3:30 pm Tu and W in his Muir office

If you can't make office hours, email him for an appointment!

Text: Zimmer and Emlen, Evolution: Making Sense of Life, Roberts & Co., 3rd edition. The text is not required, but you will find it well-written, up-to-date, and helpful.

The course will be taught in person! It will be great to have in-person interactions between students and professor and IA's again. This kind of contact improves the learning experience and allows students to take part in discussions and clarifications of the material. Please try to take part if you can! Many studies have clearly shown that students who attend class do better than those that only attend virtually.

It is clear, of course that some students will, for a wide variety of reasons, be unable to take part in person in all or part of the course. We stand ready to make accommodation for these situations.

Regulations for SS 2 state that masks must be worn by everybody, vaccinated or not, and social distancing must be observed. The latest guidelines covering vaccinations and testing can be found here:

<https://returntolearn.ucsd.edu/campus-guidelines/latest-updates/index.html>

The lectures, and the IA-led discussion sections, will be available as podcasts. Make sure that you know how to access them. They will also be added to the course home page on WebCT ("Canvas") in the form of .mov files, which can be played on your computer. In addition, extensive lecture notes, including most of the slides shown during lecture, will be posted as downloadable PDF's on the class site after

the lectures, here on the home page. Enrollees in the class should now have access to the class web site — CHECK that you do! Get in touch with Biology Instructional Services:

<https://biology.ucsd.edu/administration/units/sis/index.html>

if you can't! Important additional information about the course, such as practice exams, will also be posted on the class web page, so you should visit it regularly.

Some of you will not be able to attend in person, for at least some of the time. Coordinate with your IA about the mechanics of keeping up with the material, taking part in discussion sections, and taking exams.

Course Coverage;

The course will cover the field of evolutionary biology at a high level, and by the end of it you will feel comfortable reading and understanding papers from the current scientific literature. At the present time there is more active research about all aspects of evolution than has ever been seen before, thanks to advances in molecular biology, paleontology, developmental biology, behavior, neuroscience, and many other fields. We will explore many of these exciting new advances, which are taking place almost daily. At the end of the course we will explore the biggest evolutionary questions of the moment: how do infectious diseases arise, change and spread, how have Covid-19 and other pandemic agents evolved, and how have we as a species evolved to defend against such infectious agents? We will find that the history of our defenses goes back at least a billion years.

We will begin with a thorough examination of the process of evolution and how it takes place. We will use a mathematical approach to investigate the rules that govern gene pools, and the influences that can change allele frequencies in populations. Calculus will not be required, however. To follow these discussions, you must already be familiar with basic principles of genetics, biochemistry and molecular biology, at the level taught in lower-division introductory biology classes such as the BILD 1-2-3 series.

At the end of each week (starting with week 2), the Thursday lecture will be devoted to a discussion of a paper from the current literature that I will post as a PDF on the class web site the week before. The papers will be a challenge to read at first, but remember that you can easily find definitions of terms you don't understand on-line. Each of the four papers will deal with a current aspect of evolutionary research, and will introduce you to some of the newest techniques that can be applied to the resolution of questions and controversies in the field. I encourage you to come to the discussion prepared to examine the assumptions of the papers, and to suggest testable hypotheses that might be used to check and extend the work that is presented in each paper. As an encouragement for your participation, remember that some of this material may easily find its way onto the exams...

In addition to the final exam on Friday Sept. 2, there will be one midterm, on Tuesday Aug. 16. The midterm will count 30% of your grade, and the final exam 60%, with the two quizzes in section counting for the remaining ten percent. Exam formats will have a variety of short-answer questions, questions that require calculations, and questions that test your understanding of the material rather than rote memorization. The final exam will emphasize the second half of the course, but it will include some questions from the first half as well.

There will be IA-led review sessions before the midterm and the final. An IA-led on-line discussion forum will also be available on the Canvas site. Please avail yourself of the forum, but check to make sure that your question has not already been answered. In-depth discussions of the material in the course, and of recent advances in evolutionary biology, are encouraged.

Outline of lectures:	Text readings (Emlen and Zimmer, Evolution 3rd ed. 2020, not required but helpful):
Aug. 1 Darwinian and neo-Darwinian evolution.	Chapter 2
Aug. 2 An introduction to phylogenetic trees	Chapter 4
Aug. 3 The origins of genetic variation. Types of mutation.	Chapter 5
Aug. 4 The Hardy-Weinberg Law and its exceptions	Chapter 6
Aug. 8 Selection, random drift and gene flow	Chapter 6, Chapter 8
Aug. 9 Mechanisms leading to gene substitution and polymorphism	Chapter 6 sect. 6-7
Aug. 10 Linkage, genetic recombination and the evolution of sex	Chapters 7, 11
Aug 11 Discussion of Paper 1	
Aug. 15 Adaptation	Chapter 10
Aug 16 MIDTERM.	
Aug 17 Sexual selection and kin selection	Chapter 11.2-11.6
Aug 18 Discussion of Paper 2	

Aug 22	Game theory, behavior, and life history evolution	Chapter 16
Aug 23	Speciation	Chapter 13
Aug 24	The basics of molecular evolution and the evolution of genomes. The fossil record.	Chapters 9, 3, 14
Aug 25	Discussion of Paper 3	
Aug 29	Evolution and development, major evolutionary adaptations	Chapter 9
Aug 30	Human evolution	Chapter 17
Aug 31	The coevolution of diseases and of their hosts	Chapter 18
Sept 1	Discussion of Paper 4	
Sept. 2.	FINAL (location TBA)	