

**PRINCIPLES OF EVOLUTION**  
Biology 325  
CALIFORNIA STATE UNIVERSITY, FULLERTON  
Spring 2009

- Instructor:** Dr. Doug Eernisse  
McCarthy Hall 217C  
x3749 (enter MH207 after calling on provided campus phone)  
email: [deernisse@fullerton.edu](mailto:deernisse@fullerton.edu)
- Class Meeting:** MH 217, Tuesday/Thursday 5:30-6:45 pm
- Office Hours:** Tues 2:00-5:00 Wed 3:00-4:00  
I am also available by appointment, and over email. However, it can be difficult to find me at short notice, so plan ahead!
- Official Website:** <http://biology.fullerton.edu/biol325>

**Required Text:**

Freeman, S and J. C. Herron. 2007. Evolutionary Analysis, 4<sup>th</sup> Edition. Pearson Prentice Hall. Upper Saddle River, NJ. ISBN 0-13-227584-8 [Please do not get earlier editions.]

**Recommended:**

Carroll, S. B. 2009. Into the Jungle: Great Adventures in the Search for Evolution. Pearson Benjamin Cummings. San Francisco, CA. ISBN 0-321-55671-2 [available bundled with Freeman & Herron at Titan Shops for no extra charge].

**Prerequisites:** To enroll in Principles of Evolution, students must have successfully completed the entire biology core (Biol 171, 172, 273, 274). These prerequisites will be checked and you will be administratively dropped at the end of Week 1 if you have not completed the core. If you have completed equivalent courses that do not yet show up on your Titan Degree Audit then please provide documentation to me.

**Course Format:** Lecture, small and large group discussion and problem sets, oral presentations by small groups of students.

**Course Objectives:** Illustrate the relevance of evolution to all of modern biology and to practical real-world problems. Evolutionary questions that may be considered include 1) Where did HIV come from? 2) Why are flowering plants so evolutionarily successful? 3) How does antibiotic resistance evolve? and 4) Why do vampire bats share food? This course will explore mechanisms of evolutionary change, including mutation, selection, migration, and drift. Students will be introduced to methods for studying adaptations.

### **Student Learning Outcomes:**

Students who successfully master the material in this course will be able to:

1. Describe classical and modern evidence for evolution and natural selection.
2. Use a combination of mathematical and experimental models to describe how selection, mutation, migration, and drift act on variation to produce evolutionary change.
3. Design experiments to test the hypothesis that a particular trait is adaptive.
4. Explain the evolutionary basis of sexual selection, altruism, and kin selection.
5. Explore the processes and patterns involved in speciation, including geographic isolation, selection for reproductive isolation, and ecological specialization.
6. Integrate skills and conceptual understanding of phylogenetic inference throughout the course, including evaluation of the evidence supporting particular groupings.
7. Explore how biological questions such as coevolution, ecological specialization, and adaptation can be tested from a phylogenetic perspective.
8. Illustrate how organisms have diversified, the impact of mass extinctions, and how molecular genetics and bioinformatics can be applied to explain key innovations in organisms.
9. Investigate comparative phylogenomic patterns made possible by the availability of multiple complete genome sequences.
10. Illustrate the integration of evolution and development in the investigation of patterns of gene regulation and expression in animals and plants.

### **Course Requirements:**

Because of the interactive nature of this course, unexcused absences and repeated lateness will adversely affect your grade. Specifically, this and the extent to which you participate fully in class discussions will affect 'participation points,' which amount to about 5% of the total points available. If you are more than 15 minutes late, this counts as an absence. More importantly, you should be ready to take a brief quiz at the beginning of each class session and you will lose valuable points, for which there is no make-up opportunity, by being late or absent. Unless announced for the entire class otherwise, late assignments lose 10% of available points per day or portion of day, including weekends.

**1. Study Questions, homework, and classwork:** Every week you will read assigned pages from Freeman & Herron and complete the assigned associated 'Chapter Study Questions' ('SQs') linked to the web-based schedule, in that order, before each

class. You do not need to turn in you completed SQs! Quizzes and exams are based on variations of these on-line questions, so completing them before class will greatly impact your score on these quizzes and later exams. However, it is a mistake to try to look up the answers without reading the chapter first. Students who try this approach usually do poorly in the course. Besides some in-class assignments, there will also be some take-home assignments, for example, exercises designed to build skills associated with interpreting evolutionary trees, phylogenetic analysis, and phylogeny-based classifications. You should plan to spend approximately 6 to 9 hours a week completing the reading, homework and other assignments. Quizzes, homework, and classwork are worth approximately 20% of your final grade.

**2. Paper or Issue review:** You will either review a recent (within 1 year) paper or a current issue in evolution. You need to meet with me, bringing either a copy of the paper or information on the issue, at least two weeks before the review is due, so that I can confirm that it is appropriate. The paper review is worth 10% of your final grade. The review must be submitted electronically to Turnitin.com - you will receive detailed instructions on how to do this. Please see the paper review assignment handout for further details. You will also prepare (with my assistance) a 15-minute presentation and/or group activity (and associated homework and exam question) for your paper or issue (for 5% of your grade).

**3. Exams:** You will have two, non-cumulative midterm exams (75 points each) and a partly cumulative final exam (125 points). These will test your understanding of the course reading and homework, and your ability to apply your understanding in solving novel problems. The exam format will be similar to the assigned study questions, as well as additional discussion questions and problems you will be working on in class. The best way to prepare for exams is to keep up on your reading, complete your SQs carefully and thoughtfully, take coherent, organized notes, and participate actively in group discussions. Each exam is worth 10% of your final grade.

To review, your grade in this course will be assessed as follows:

Quizzes, homework, and classwork	20%
Paper or Issue review	10%
Class presentation & questions	5%
Participation, punctual attendance	5%
Exams – 2 midterms, 1 final	<u>60%</u>
TOTAL	100%

**Quiz, Exam, and Assignment Make Up Policy:** A quiz cannot be made up regardless of why you missed it. Students that cannot take a midterm or final exam at the scheduled time should contact the instructor as soon as possible with appropriate documentation verifying the circumstances. Make up exams or assignments are given at the discretion of the instructor and will only be given in the case of documented emergencies or unavoidable conflicts. Unexcused absences during an exam will receive a score of zero.

## Grading Scale

Your grade will be determined on the following scale. If appropriate, grade cut-offs may be scaled down (i.e. curved) but they will not be scaled up.

93% and above	A
90 – 92%	A-
87 - 89%	B+
83 – 86%	B
80 – 82%	B-
77 - 79%	C+
73 – 76%	C
70 – 72%	C-
67 – 69%	D+
63 – 66%	D
60 – 62%	D-
59% and below	F

## Extra Credit (15 pts. Total possible)

A modest number of extra credit points will be awarded for attending the Biology Seminar Series (W at 4-5 p.m., MH-513, or as announced; see <http://biology.fullerton.edu/events/semS09.html>) or other official seminars presented on this or another campus, provided there is some connection to evolutionary biology. You will also need to turn in a seminar write-up, which should generally emphasize the evolutionary aspects of the seminar as much as possible. The seminar write-ups will be worth 5 possible points for up to a maximum of three seminars that you attend (15 points total). Students are also encouraged to enroll for one unit Biology 480 (section 1; schedule # 10793) to attend the seminars on a regular basis, but if you do please turn in a separate write-up for me from anything you turn in to the Biology 480 instructor. I will occasionally announce other seminars for which you can earn extra credit, in case you cannot attend Biology's regular seminar series due to a schedule conflict, but see the bulletin board outside MH287 for many posted seminars that will likely be permitted as substitutes. For seminar write-ups, you are welcome to use your own approach in completing the write-up. Otherwise, try answering the following three questions: 1) What is the basic take-home message? 2) What question(s) would (or did) you ask the speaker? and 3) How can you suggest that this research might be extended? I like to read original thoughtful reviews, relevant questions that you pose after attending the seminar, and ideas for future research. You should do your best to take appropriate notes in the seminar but then go home and rewrite them into an organized format and using a word processor. Remember, your write-ups need to have thoughtful responses to these questions in order to get the maximum extra credit points possible.

## Appropriate Classroom Behavior

Students are expected to attend and participate in lectures.

While in lecture, please turn cell phones off or, if absolutely necessary, to vibrate. Using a computer to take notes or do course related exercises in class is acceptable. Using a computer or your cell phone to watch movies, instant message, surf the web, or do other non-course related activities is not appropriate in class. This is especially problematic if it disrupts class.

Inappropriate use of cell phones or laptops may result in a deduction of 5% from your final course grade for each offense.

**Academic honesty and original work:** As a member of the CSUF academic community, you are expected to submit only your own, original work for all assignments. I feel strongly that maintaining academic honesty is crucial to maintaining a vibrant and productive learning community, and so will prosecute fully any plagiarism or cheating. If you are ever unsure whether something you or a fellow student is about to do is intellectually dishonest, please err on the conservative side and ask me. I promise not to be angry with you if you ask me first! See the CSUF Student Guide to Avoiding Plagiarism for further guidelines (available on-line at: <http://www.fullerton.edu/deanofstudents/judicial/>.) First offense: 0 on the assignment. Second offense: F for the course. In either case, you will be reported to the Vice President for Student Affairs.

**Withdrawal Policy:** The CSUF policy regarding withdrawal from classes (UPS 300.016) will be followed. After the first two weeks of the semester, students may be granted withdrawal ONLY by presenting compelling evidence outlining a physical, medical, or emotional condition that prevents completion of the course. Poor academic performance is not evidence of a serious reason for withdrawal. Students unable to produce official documentation will be required to take the grade they have earned in the class. Please refer to the CSUF Class Schedule for information on the last day to withdraw with a W grade. Important dates concerning registration or drops are on the inside cover of the CSUF Spring 2009 Class Schedule or at: <http://www.fullerton.edu/admissions/>.

**Accommodations for Special Needs:** Students with documented learning disabilities should make me aware of the need for accommodations. I will work with you to ensure that you have the best possible learning experience.

**Classroom safety:**

- ◆ In the event of an emergency such as earthquake or fire:
  - Take all your personal belongings and leave the classroom (or lab).
  - Use the stairways located at the east, west, or center of the building.
  - Do not use the elevator. They may not be working once the alarm sounds.
  - Go to the lawn area towards Nutwood Avenue.
  - Stay with class members for further instruction.
- ◆ For additional information on exits, fire alarms and telephones, Building Evacuation Maps are located near each elevator.
- ◆ Anyone who may have difficulty evacuating the building, please see me after class.
- ◆ Dial 911 on any campus phone, pay phone, or blue emergency phones to connect directly to University Police. Dialing 911 on your cell phone will connect with the Highway Patrol. Tell CHP dispatcher that CSUF Police are the responding agency. Stay on the line until asked to hang up.
- ◆ If you want to bring visitors to the classroom, you must obtain permission from the instructor in advance and must sign a volunteer form.
- ◆ Visitors to the lab must obtain permission from the Chair and must sign a volunteer form.
- ◆ There is no smoking within 20 feet of every campus building. This includes the MH balcony.

**Tentative course outline (next page) is subject to change with three days notice – see official course schedule at:**

<http://biology.fullerton.edu/biol325/lecture.html>

# Evolution

## Biol. 325 - Prof. Eernisse

### California State University, Fullerton

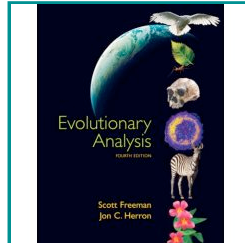
### Discussion Information

### Spring 2009

### Schedule Number 18458

#### Provisional Discussion, Activities, and Readings Outline

(All chapter references are to EA = *Evolutionary Analysis* 4th Edition;



Buy *Evolutionary Analysis* at [Titan Shops On-line](#) or at [Amazon.com](#)

DATE	DISCUSSION TOPIC	ASSIGNM	Chapt. SQ'S
Jan 27 Jan 29	<b>Introduction to Course - Common Misconceptions about Evolution</b> <b>Evidence for Evolution - Always be ready for brief quiz on assigned reading and web Chapter Study Questions (SQs)</b>	See below, complete assignments before class EA Ch. 2 pp. 37-60; Carroll - Ch. 1 (Blackboard)	(additional handouts TBA) <a href="#">SQs2:2-10</a> <a href="#">Carroll Qs#1</a>
Feb 3 Feb 5	<b>Evidence for Evolution (cont.), Darwinian Natural Selection</b> <b>The Nature of Selection (<a href="#">Start Cladogram 1 Assignment</a>)</b>	EA Ch. 2 pp. 60-65; Carroll - Ch. 2 (Blackboard) EA 3 pp. 73-90	<a href="#">SQs2:11-14</a> <a href="#">Carroll Qs#2</a> <a href="#">SQs3: 1-7</a>
Feb 10 Feb 12	<b>The Nature of Selection and Intro to Trees (Ch 3 and handout) (Research Topic Identified)</b> <b>Estimating Evolutionary Trees (Cladogram 1 Assignm. Due; <a href="#">Start Cladogram 2 Assignment</a>) DARWIN'S 200th!</b>	Ch. 3 pp. 90-105 EA Ch. 4 pp. 111-127 and Gregory 2008 handout	<a href="#">SQs3:8-15</a> <a href="#">SQs4:1-8</a>
Feb 17 Feb 19	<b>Using Phylogenies to Answer Questions (Reference list for research paper due – 1%)</b> <b>Mutations and Genetic Variation</b>	EA Ch. 4 pp. 127-138 and Gregory 2008 handout EA Ch. 5 pp. 143-166	<a href="#">SQs4:9-11</a> <a href="#">Gregory Qs</a> <a href="#">SQs5:1-15</a>
Feb 24 Feb 26	<b>Mendelian Genetics in Populations I: Mechanisms of Evolutionary Change (Cladogram 2 Assignm. Due)</b> <b>Testing Population Genetics Theory</b>	EA Ch. 6 pp. 169-194 EA Ch. 6 pp. 194-218	<a href="#">SQs6: 1-3, 6, 9, 14</a> <a href="#">SQs6: 5, 7, 10-13</a>
Mar 3 Mar 5	<b>Midterm 1</b> <b>Mendelian Genetics in Populations II: Migration, Genetic Drift</b>	<b>Unit 1: EA Chs. 1-6</b> EA Ch. 7 pp. 223-251	<a href="#">SQs7:1-8</a>
Mar 10 Mar 12	<b>Genetic Drift (cont.) and Non-random Mating (Literature review for research paper due – 1%)</b> <b>Studying Adaptation: Evol. Analysis of Form and Function (Start Cladogram 3 Assignment)</b>	EA Ch. 7 pp. 251-276 EA Ch. 10 pp. 363-375	<a href="#">SQs7:9-15</a> <a href="#">SQs10:1-7,11</a>
Mar 17 Mar 19	<b>Adaptation (cont.)</b> <b>Sexual Selection (Cladogram 3 Assignment due)</b>	EA Ch. 10 pp. 376-396 EA Ch. 11 pp. 401-438	<a href="#">SQs10:8-10,12</a> <a href="#">SQs11:1-19</a>
Mar 24 Mar 26	<b>Kin Selection and Social Behavior (Start Cladogram 4 Assignment)</b> <b>Evolution and Human Health</b>	EA Ch. 12 pp. 447-478 EA Ch. 14 pp. 529-569	<a href="#">SQs12:1-17</a> <a href="#">SQs14:1-24</a>
Mar 30->	<b>Spring Break - No Classes</b>		
Apr 7 Apr 9	<b>Phylogenomics and the Molecular Basis of Adaptation</b> <b>Mechanisms of Speciation (Experimental design for research paper due – 1%; Cladogram 4 Assignment due)</b>	EA Ch. 15 pp. 575-600 EA Ch. 16 pp. 605-633	<a href="#">SQs15:1-14</a> <a href="#">SQs16:1-11</a>

Apr 14 Apr 16	<b>Review</b> <b>Midterm 2</b>	<b>Review</b> <b>Unit 2:</b> <b>EA Chs. 7,</b> <b>10-12,</b> <b>14-16</b>	
Apr 21 Apr 23	<b>The Origins of Life and Precambrian Evolution (Assignment - TBA)</b> <b>The Origins of Life and Precambrian Evolution</b>	EA Ch. 17 pp. 639-660 EA Ch. 17 pp. 660-681	<a href="#">SQs17:1-7</a> <a href="#">SQs17:8-18</a>
Apr 28 Apr 30	<b>The Cambrian Explosion and Beyond</b> <b>Evolution of Land Vertebrates</b>	<b>EA Ch. 18</b> <b>pp.</b> <b>689-721</b> EA Ch. 18, Start EA Ch. 20!	<a href="#">SQs18: 1-6</a> <a href="#">SQs18: 7-12</a>
May 5 May 7	<b>Primate Relatives and Human Evolution (First draft of research paper due – Peer Review starts)</b> <b>The Origin of <i>Homo sapiens</i> (Peer review reports due - 1%)</b>	EA Ch. 20 pp. 753-773 EA Ch. 20 pp. 773-791	<a href="#">SQs20: 1-4</a> <a href="#">SQs20: 5-9</a>
May 12 May 14	<b>Student Presentations</b> <b>Student Presentations (Final draft of research paper due)</b>		
Th May 21	<b>Final Exam (1/3 Units 1-2 and 2/3 Unit 3)</b>	5:00-6:50 MH287	

**Return to:**

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- [History of Life Links](#)
- [Biological Science Home Page](#)
- [Links for Evolution by Taxon \(outdated!\)](#)
- [Links for Evolution by Topic \(outdated!\)](#)

This page was last updated Jan. 27, 2009 - de