

BIOL 4400: Evolution

Spring 2012

Professor: Dr. Jennifer Cooper

Office: N256

Class: TTh 12:30 – 1:45 (N322)

Office hours: Monday 11:00 – 1:00, Wednesday 1:00 – 2:00

Email: jcooper3@csustan.edu (write BIOL 4400 in the subject line of all emails to me)

Prerequisites: BIOL 3350 (Genetics) with a D or better

Text/Materials: *Evolution, 2nd edition* (abridged version), by D.J. Futuyma.

Bring a calculator as well as the book to class every day.

“Nothing in biology makes sense except in light of evolution.”

-- Theodosius Dobzhansky (1973), geneticist & zoologist

The quotation above is one that is known to every biologist. Evolution is **the** central and unifying principle of modern biology and is an experimental, observational, mathematical and correlative science. While evolution is integral to most biology courses in our curriculum, no single course covers this essential topic in its entirety. Moreover, one semester is not enough time to explore all aspects of evolution, so we will explore major concepts, hypotheses, experiments and case studies to understand and investigate mechanisms of evolutionary change (e.g., natural & sexual selection, mutation, recombination, genetic drift, gene flow).

COURSE REQUIREMENTS

Because BIOL 3350 (Introductory Genetics) is a pre-requisite for this class (and the freshmen biology sequence is a pre-requisite for genetics), you have been given a handout that reviews terms and topics that were covered in that class (basic knowledge of cells, DNA, genetics, taxonomy, and arithmetic). Because I will not review them again here, it is your responsibility to review/recall them, and exam questions will assume your familiarity with that material.

An integral goal of this course is your continued development of critical thinking, written and verbal communication, quantitative reasoning, and experimental design skills. Lectures, homework assignments and videos will guide you in the development of these skills. **I will assume you have read the associated material listed in the schedule prior to coming to class and I may call on you to answer questions and participate in discussions.** The rigors of this course demand regular attendance, commitment and concentration to the readings and lectures. As per university regulations, students with excessive absences will be dropped from the class.

Graduate students who are enrolled in this class are expected to perform at a higher level than undergraduates (see handout); subsequently (and according to university policies), graduate students will receive additional assignments.

GRADING PROCEDURE

Lecture Exams (3 @ 100 points each)	300
Comprehensive Final	100
Homework	200
Total	600 points

A = 540-600, B = 480-539, C = 420-479, D = 360-419, F < 360 points. No +/- grading will be applied to your final grade.

Homework assignments will often come from the textbook, or from the online textbook resources found at <http://www.sinauer.com/evolution/index.html>. Homework assignments will lose 20% of their value for each day they are late. I expect you to WORK INDEPENDENTLY on homework assignments.

Even in small classes it is essential that students respect the rights of others. Therefore, those who disrupt the class by talking or any other means will be asked to leave. Turn off your cell phones before class begins.

EXAMS

The exams will be given in a mixed format (short answer/essay, graph interpretation, matching, fill-in-the-blank). The final exam is cumulative; that means that it will include material covered in the previous exams. I do not recycle exam questions. Lecture exam 1 is scheduled before the census date so that a student will get an idea of the grade they can expect to earn on subsequent exams. **A student who fails the first lecture exam should seriously consider dropping the course. Do not make the mistake of underestimating the difficulty of exams.**

Students who arrive after the first exam of the day has been turned in will not be allowed to take the exam. If you must leave the room for personal reasons, you will not be allowed to finish the in-class exam. Your partially finished exam will be graded as it stands. If you miss an exam for any reason, you must take an alternate exam before the in-class exam is scheduled to take place. If you miss an exam unexpectedly, and do not have documentation of a legitimate reason for doing so, you will not be allowed to take the alternate exam, and your total exam points will be based on the average of your other in-class exams.

Cheating in any form is inappropriate conduct and will be dealt with swiftly and severely according to Sections 41301 through 41304 of Title 5 of the *California Code of Regulations* which includes expulsion, suspension and probation. When you turn in your exam, you will be required to show photo identification. I may relax this rule later in the semester, once I have learned to recognize each student.

STUDENT LEARNING OBJECTIVES:

1. Students will be able to distinguish between different processes (with evidence and examples of these processes) that lead to evolutionary change in organisms (i.e., natural selection, mutation, recombination, gene flow, genetic drift, sexual selection).
2. Students will be able to communicate the relevance of evolution to health, agriculture, forensic science, conservation, human origins, & even thoughtful consumerism.
3. Students will be able to communicate examples of evidence for evolution from genetics, biogeography, paleontology, comparative anatomy, biochemistry, molecular biology & physical anthropology.
4. Students will be able to construct an historical timeline of people, places & events that shaped understanding & development of the modern theory of evolution & its processes.
5. Students will be able to demonstrate knowledge of relationships between evolution & biological diversity through scientific understanding of common ancestors & phylogenetic relationships of fossils & living organisms (i.e., "tree thinking") and speciation events.
6. Students will have enhanced understanding of the peer-reviewed literature in science, its decentralized, cumulative, self-correcting, & hypothesis-testing features, & be able to distinguish it from pseudoscience, such as "creation science" & intelligent design.

LECTURE OUTLINE AND READING ASSIGNMENTS*

Date	Lecture and (Presentations)	Reading	Homework
1/26	Introduction	F1	
1/31	Phylogenetics ("Tree Thinking")	F2	ForensicEA Sim, due 2/7
2/2	Patterns of Evolution	F3	
2/7	The Fossil Record	F4	p. 100 # 1, 3, 6, due 2/14
2/9	NOVA video: Extinction!		
2/14	Geography of Evolution	F6	F6 online exercise # 1-10, due 2/21
2/16			
2/21	Exam 1		
2/23	Mutation	F8	p. 214 # 3, 8, due 3/1
2/28			
3/1	Phenotypic & Genetic Variation	F9	F9 online exercise # 1-5, due 3/8
3/6			
3/8	Genetic Drift	F10	F10 online exercise # 1-11, due 3/15
3/13			
3/15	Natural Selection & Adaptation	F11	p. 301 # 5-7 due 3/20
3/20	Genetical Theory of Natural Selection	F12	p. 335 # 1-2 due 3/22
3/22	Exam 2		
3/27	Sex and Reproductive Success	F15	F15 online exercise # 1-8, due 4/3
3/29	NOVA video clip: Why Sex?		
4/3	Conflict & Cooperation	F16	F16 online exercise # 1-8, due 4/17
4/5	NOVA video: Evolutionary Arms Race		
4/10	SPRING BREAK		
4/13	SPRING BREAK		
4/17	Species and speciation	F17, F18	F17 online exercise # 1-3, due 4/24
4/19			p. 498 # 3, 5, 8 due 4/24
4/24	Exam 3		
4/26	Coevolution	F19	p. 521 # 1-2 due 5/3
5/1			
5/3	Evo-Devo	F21	p. 584 # 2, 5 due 5/10
5/8			
5/10	Macroevolution	F22	F22 online exercise # 1-9, due 4/15
5/15	NOVA video: Judgment Day		
5/22	Comprehensive Final Exam 11:15 a.m.-1:15 p.m. in the regular classroom.		

*Reading assignments listed on the course outline above are for *Evolution* by Futuyma (F1, F2, etc.). Topic content and dates of coverage in the syllabus may be changed due to extenuating circumstances.

Some Web Resources on Evolution:

Anonymous (1994). *Talk Origins*. Web address: <http://www.talkorigins.org/>

Anonymous (2000). *The Evolution and Medicine Review*. Web address: <http://www.evolutionandmedicine.org/>.

Cold Spring Harbor Laboratory (2000). *DNA from the Beginning*. Web address: <http://vector.cshl.org/dnaftb/>

Darwin, Charles (1859). *On the origin of species by means of natural selection, or the preservation of favored races in the struggle for life*. Web address: <http://www.literature.org/authors/darwin-charles/the-origin-of-the-species/> (also in our library).

European Society for Evolutionary Biology (publishes *Journal of Evolutionary Biology*, the European equivalent of *Evolution*). Web address: <http://www.eseb.org/>.

Geological Time Scale (UC-Berkeley) website: <http://www.ucmp.berkeley.edu/help/timeform.html>

Kitzmiller vs. Dover (2004-05) court case. Web address for court documents, etc: http://www.talkorigins.org/faqs/dover/kitzmiller_v_dover.html.

Mendel, Gregor. 1865. *Experiments in Plant Hybridization*. Web address: <http://www.mendelweb.org/Mendel.html> (also available in our library).

Movie "Expelled" exposed (NCSE rebuts false claims of creationists): <http://www.expelledexposed.com/>.

National Center for Science Education (2000). *Defending the Teaching of Evolution in the Public Schools*. Web address: <http://www.natcensci.org>

National Academy of Sciences (1998). *Teaching About Evolution and the Nature of Science*. Web address: <http://www.nap.edu/html/evolution98/contents.html>

PBS Evolution Video Series (2003). *Evolution: A Journey into Where We're From and Where We're Going*. Web address: <http://www.pbs.org/wgbh/evolution/>.

Society for the Study of Evolution (publishes *Evolution*, the international peer-reviewed journal of organic evolution). Web address: <http://www.evolutionsociety.org/>.

Society of Systematic Biology (publishes *Systematic Biology*, the international peer-reviewed journal of biological diversity and its origins). Web address: <http://systbiol.org/>.

Understanding Evolution (UC-Berkeley) website: <http://evolution.berkeley.edu/>.