

BIOL 4400: Evolution, Spring 2013

Professor: Dr. Jennifer Cooper
Office: N256
Office hours: Tuesday 9:30 – 11:30
Thursday 12:30 - 1:30
Email: jcooper3@csustan.edu (write BIOL 4400 in the subject line of all emails to me)
Prerequisites: BIOL 3350 (Genetics) with a grade of D or better

“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.

REQUIRED TEXTS/MATERIALS

Evolution, 2nd edition (abridged version), by D.J. Futuyma. I will not be making PowerPoint lectures available for student download.

CENSUS DATE

Students must attend the first three class sessions or they will be dropped from the course.

This course cannot be taken for credit. It can only be taken for a letter grade. Students can only drop this course prior to the census date of February 22.

GRADING PROCEDURE

Exam 1	100
Exam 2	100
Comprehensive Final Exam	100
<u>Study group work</u>	
Homework assignments	150
Article summaries (5 @ 10 points each)	50
Poster presentation	100
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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.

EXAMS

The exams will be given in a mixed format (short answer/essay, graph interpretation, 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 first exam, you will be required to show photo identification. I will relax this rule later in the semester, once I have learned to recognize each student.

STUDY GROUPS

You will be randomly assigned to a study group at the beginning of the semester. Study groups will consist of 4 students. You will work very closely with your study group members throughout the semester... you will sit as a group in lecture, and you will work as a team to analyze data sets and perform homework assignments and the poster presentation. Part of your grade is dependent on your teamwork, thus every group member must do their share of the work!

Each study group will nominate a study group leader, and this position is worth 20 points extra credit. The group leader will provide an electronic copy of each written assignment. The leader will also keep a private written record of the performance of each group member in work sessions, and this cumulative report will be emailed to me after exams 1, 2 and the final exam. These reports will alert me to problems with individual group members who don't do their share of the work, or who miss group meetings.

HOMEWORK ASSIGNMENTS (STUDY GROUP ACTIVITY)

Assignments will often come from the textbook, or from the online textbook resources found at <http://www.sinauer.com/evolution/index.html>. Assignments will be submitted as a single document for your study group.

I **strongly suggest** that your group meet weekly in person to do homework assignments together. Every group member should contribute toward a consensus answer for each question. It will be tempting to break the assignment into chunks and have each group member answer one or two questions. **Avoid this temptation.** Groups who operate this way usually perform very poorly, because most questions can only be answered based on a complete understanding of the previous questions.

READINGS AND SUMMARIES (STUDY GROUP ACTIVITY)

I will assign 5 journal articles from the primary literature which address concepts and topics covered in this course. **Summaries should be 2 pages, double-spaced, 11 or 12 pt font.** Yes, you can make them a little longer, but don't get crazy.

These reading assignments are designed to help you understand complex concepts, and to make you familiar with research in those areas. Reading them will also help prepare you for your poster presentation. Writing the summaries will help you learn to think and write about these concepts, a skill which will be tested on the exams.

I **strongly suggest** that your group meet weekly in person to **discuss** these readings and to draft a summary. Thus every group member must read the assigned article before the meeting, so that they can contribute toward writing the summary. Avoid the temptation to assign each reading to a different group member. A more useful strategy for equalizing the workload would be to have each group member read the Abstract plus one other section (Introduction, Results, etc) and provide a verbal and written summary to the other group members. Then the written sections can be joined into a single document, polished by the best writer in the group, and submitted for a grade. I will feel free to include essay questions over the readings on lecture exams.

POSTER PRESENTATION (STUDY GROUP ACTIVITY)

Poster presentations allow for a personalized interaction between the presenter and the individual audience members, as conference attendees walk through the poster session browsing the selections. Posters have the added advantage of being less intimidating to present, since the audience has something to read and the presenter can mainly clarify points and field questions.

Each study group will select a different recent primary literature article (hint: must have a methodology section) relating directly to evolution. To find an article:

- Go to the CSU Stanislaus library website (link on University homepage).
- Click "Articles" tab.
- Down at the bottom, click "Databases by title."
- Choose "Biological Abstracts."
- Search on a combination of author and title terms to find the specific article.
- Once you have located the abstract, click the "FIND IT!" link to access the full-text PDF.

Your group's paper must be no older than 2006. Group members will pretend to be co-authors on the paper, get intimately familiar with the work, and present it as a poster at the end of semester Poster Session.

- 1) **Email me by April 22**, and include a pdf of the journal article you have chosen.
- 2) I will review each submission, and I will notify you if your article is not acceptable.

It is easy to use Microsoft PowerPoint to prepare a poster presentation, simply by adding components (text boxes, images) to a single slide. You must format the slide as a custom size and indicate how large a print you want your final poster to be. **Your poster for class must be printed on a large format printer at a professional printing service (Kinko's, Staples, etc).** Although I provide some rough guidelines for pricing below, talk to your print shop ahead of time to find out at what size they print posters, cost, and how long it takes.

- The main goal of a poster is to relate the main points of your paper with as little effort as possible on the part of the audience to read, interpret, and understand. Only present the main points.
- Use a suitable font size (can be read from about four feet away).
- Sections should have appropriate labels (Introduction, Methods, etc).
- Include a Title, Authors and Addresses, Abstract, Introduction, Methods, Results & Discussion.
- Graphics are required (figures, special equations, photos).
- Only include Literature Cited if you use a major source in the body of the poster (even though the original paper has lots of references).
- Present as clearly as possible with as little text as you can get away with (used bulleted lists instead of paragraphs when you can).
- Use graphics to explain sections when possible.
- Do NOT duplicate the same information in your figures/tables and a verbal results/discussion. Use an explanatory caption to explain how the data shown in the figure supports the conclusion in the caption.

USEFUL WEBSITES ON POSTER PRESENTATION

Purrington, C. 2007. Advice on designing scientific posters.
<<http://www.swarthmore.edu/NatSci/cpurrin1/posteradvice.htm>>.

Stoss, F. 2008. Designing Effective Poster Presentations by The University of Buffalo's Art And Sciences Libraries.
<<http://ublib.buffalo.edu/libraries/asl/guides/bio/posters.html>>.

PRINTING YOUR POSTER

FedEx Kinkos www.kinkos.com (800) 463---3339 1451 Geer Rd, Turlock, CA 2225 Plaza Pkwy # C11, Modesto, CA

Services:

Black and white or full color, several paper types, online print orders

Time to print:

Approximately 2 hours for black and white, 24 hours for color. Send your file by e---mail and it will be ready for pick up when you arrive.

Cost:

30" x 36" Color \$58, B&W \$6

Staples (209) 632---2209 1850 Countryside Dr, Turlock, CA

Services:

Black and white or full color, several paper types, online print orders and mail delivery

Time to print:

2---3 hours for color, black and white 1 hour

Cost:

36" x 48" Color \$84, B&W 7

24" x 36" Color \$45, B&W \$4

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 ASSIGNMENT

Reading assignments listed on the course outline are for *Evolution* by Futuyma (F1, F2, etc.).

Week	Lecture and (Presentations)	Reading	Homework
1/28 - 2/1	Introduction Phylogenetics	Ch 1 Ch 2	F2 online exercise #1-12, due 2/4
2/4 - 2/8	Patterns of Evolution	Ch 3	Reading summary 1 due 2/8
2/11 - 2/15	NOVA video: Extinction! The Fossil Record	Ch 4	Ch 4 p. 100 # 1, 3, 6, due 2/18
2/18 - 2/22	Geography of Evolution Exam 1 on 2/22 (Census Date)	Ch 6	F6 online exercise # 1-10, due 2/22
2/25 - 3/1	Mutation	Ch 8	Ch 8 p. 214 # 3, 8, due 3/4 Reading summary 2 due 3/8
3/4 - 3/8	Phenotypic & Genetic Variation	Ch 9	F9 online exercise # 1-5, due 3/13
3/11 - 3/15	Genetic Drift	Ch 10	F10 online exercise # 1-11, due 3/18
3/18 - 3/22	Natural Selection & Adaptation	Ch 11	Reading summary 3 due 3/22 Ch 11 p. 301 # 5-7 due 3/25
3/25 - 3/29	Genetical Theory of Natural Selection	Ch 12	Ch 12 p. 335 # 1-2 due 3/29
4/1 - 4-5	SPRING BREAK		
4/8 - 4/12	Sex and Reproductive Success NOVA video clip: Why Sex? Exam 2 on 4/12	Ch 15	F15 online exercise # 1-8, due 4/12
4/15 - 4/19	Conflict & Cooperation NOVA video: Evolutionary Arms Race	Ch 16	Reading summary 4 due 4/17 F16 online exercise # 1-8, due 4/22
4/22 - 4/26	Species and speciation Choose poster journal article by 4/22	Ch 17 Ch 18	F17 online exercise # 1-3, due 4/29 Ch 18 p. 498 # 3, 5, 8 due 5/3
4/29 - 5/3	Coevolution	Ch 19	Ch 19 p. 521 # 1-2 due 5/8 Reading summary 5 due 5/10
5/6 - 5/10	Evo-Devo	Ch 21	Ch 21 p. 584 # 2, 5 due 5/13
5/13 - 5/17	Macroevolution	CH 22	F22 online exercise # 1-9, due 5/17
5/24	Comprehensive Final Exam 11:15 a.m.-1:15 p.m. in the regular classroom		

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
AM 5:00							
6:00							
7:00							
8:00							
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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/>.