BIOL 171: Evolution and Biodiversity
Fall 2005[*]
MW 2:30–3:45 PM
RGC 013

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Course Web Site: The course web-site will be on blackboard. You should be able to access it through http://my.fullerton.edu and follow the links to blackboard. Also, there will be activities assigned from the website for the textbook (http://www.prenhall.com/freemanbio2). You must register to use this website and the information and instructions for this process should have come with your textbook. Our class ID is cm649317.

"Seen in the light of evolution, biology is, perhaps, intellectually the most satisfying and inspiring science. Without that light it becomes a pile of sundry facts some of them interesting or curious but making no meaningful picture as a whole."
– T. Dobzhansky, 1973

COURSE DESCRIPTION AND OVERVIEW:
BIOL 171: Evolution and Biodiversity is the first of four core courses required of all Biological Science majors at CSUF. Students who successfully complete BIOL 171 will master the basic principles of the scientific process, the underlying and unifying principles of evolution that provide a foundation needed to understand the biodiversity of life, and the principles of conservation biology that can be applied to maintain the complexity and fragility of the biological world.

Student Learning Outcomes (SLOs)
The student learning outcomes are related to three themes that will run throughout all four core courses: Evolution, Unity and Diversity, and Dynamics of Biological Systems. Two perspectives, Human Impact and Scientific Process will also occur throughout.

Content Objectives

Students who successfully complete BIOL 171 will be able to:

- Define what is "living"
- Describe similarities and differences among groups of organisms at all hierarchical levels
- Recognize characteristics of major taxonomic groups
- Construct and interpret phylogenetic relationships
- Describe the relationship between form and function
- Demonstrate an understanding of evolutionary theory
- Explain how a complex structure such as an eye can evolve
- Discuss the history of evolutionary theory
- Explain the role of natural selection in evolution

[*] Syllabus adapted from Biol 171 Fall '04 syllabus developed by Dr. William Hoese

- Define species and speciation
- Describe major events in the history of life
- Recognize, measure and appreciate the breadth of biodiversity
- Discuss basic principles of conservation biology
- Apply principles of evolutionary theory to conservation issues
- Discuss conservation actions in response to loss of biodiversity

Required materials:

1. Freeman, Scott. 2005. Biological Science, 2nd Ed. Pearson Prentice Hall, Upper Saddle River, NJ.
2. Laboratory manual: Biology 171 Laboratory manual available through CSUF Bookstore.
3. Personal Response System (PRS) transmitter.
4. Laboratory Notebook (more information about this in lab)

FIELD TRIPS: Biologists often observe and study organisms in their natural habitat. You will practice this skill as part of your Biol 171 experience this semester. This entails taking 4 field trips, 2 of which are on weekends. To pass this class, you must attend all field trips.

- Zzyzx Desert Studies Center, Mojave Desert Habitat (approximately 3 hours from CSUF): Fri-Sat 9/30-10/1, Sat-Sun 10/1-2, Fri-Sat 10/7-8, **OR** Sat-Sun, 10/8-9. Each student spends one night and day observing and investigating organismal diversity and desert adaptations in the eastern Mojave Desert. Students will carpool and should plan to leave CSUF by 1:00 PM. Students will leave Zzyzx by 1:00 PM the following day. Sign-up in lab during Week 1 of the course (60 students/day max).
- Fullerton Arboretum: Mon 9/26, Tue 9/27, or Wed 9/28. During lab each student visits the Fullerton Arboretum and observes plants that are adapted to a variety of habitats.
- Dana Point, Rocky Intertidal Habitat (approximately 1 hour from CSUF): Fri 12/2, 2:30-5:00 PM, OR Sat 12/3, 2:30-5:00 PM at Dana Point. Each student spends an afternoon observing and investigating organismal diversity in the rocky intertidal habitat. Students will carpool and should plan to leave CSUF by 1:00 PM Friday or 1:30 PM Saturday.
- Tucker Wildlife Sanctuary, Coastal Sage Scrub Habitat (approximately 45 minutes from CSUF): Wed 11/16, Thurs 11/17, or Fri 11/18 during lab. Each student spends a lab period investigating conservation biology and biological diversity in the increasingly rare coastal sage scrub habitat.

GRADING:

First, some general comments: We have made every attempt to provide you with a variety of mechanisms by which you will be evaluated in Biol 171 to give you your best chance to succeed. However, it is inevitable with the diversity of abilities and backgrounds of students in *any* course that some will do well, some will do exceptionally well, and some will struggle. Nonetheless, our commitment (at least when it comes to grades) is to help you perform as well as you possibly can. To this end, we have added emphasis to components of your grade that are more in your control, such as writing assignments, presentations, and participation in discussions.

We emphasize that it is not our policy, to "weed out" students! But you must realize that this is a two-way street – if you put honest effort into the course, you will do better; if you don't, you will do worse.

Below we summarize how your final grade will be calculated. To help you with your planning for the semester, we present a list of assignments and exams and the dates on which they occur over the semester. It is a good idea to mark on your calendar now each assignment due date and exam date so you can minimize last-minute crunches. Following the list of assignments and exams, we present a breakdown of how much each will contribute to your grade.

How coursework contributes toward your grade:

Lecture Components	Date	Total Points	% of Grade
Midterm 1	9/26	120	12%
Midterm 2	11/2	120	12%
Final Exam	12/14	200	20%
PRS scores	Throughout	70	7%
Laboratory Components			
Entire Artificial Selection Assignment			
Experimental Design	Lab 3B	10	1%
Peer evaluation of project	Lab 13B	10	1%
Individual Write-Up: Intro, Methods	11/18 5PM	30	3%
Individual Write-Up: Complete Version	Lab 16A	50	5%
Biodiversity Assignment			
Presentation	TBD	20	2%
Seven entries with four original images	Labs 5B-13B	70	7%
Phylogenetic tree of biodiversity log organisms with characters mapped	Lab 16B	10	1%
Quizzes	Throughout	150	15%
Lab Notebook			10%
Labs 1A-8A	Lab 8B	50	
Labs 8B-16B	Lab 16B	50	
Student Participation		20	2%
Field Trip Participation	See above	20	2%
	Total	**1,000**	**100%**

We will not post grades. Please provide us with a self-addressed stamped postcard, check your grades online, or wait until your grades arrive in the mail from the registrar. We have provided a summary of all assignments, exams, and point values for the course. Please keep track of your own points in each area as a reference. If you have questions about your grade or cumulative points, please see us during office hours. We are happy to discuss your progress with you at any time. Your final grade will depend on the weighted average of both lecture and laboratory performances, but in order to pass the class students must pass both portions with a C or better (*PLEASE NOTE*, A **C-** IS NOT PASSING). This means that if you receive a "C-" in the laboratory portion and a "B" in the lecture portion, you will receive a "C-" in the course. Final course grades will be determined by the percentage of points in the table on the left.

Score	**Letter Grade**	**Assigned G.P.A.**
>95%	A+	4
≥ 90%	A	4
≥ 87%	A-	3.7
≥ 83%	B+	3.3
≥ 80%	B	3
≥ 77%	B-	2.7
≥ 73%	C+	2.3
≥ 70%	C	2
≥ 67%	C-	1.7
≥ 63%	D+	1.3
≥ 60%	D	1
≥ 57%	D-	0.7
< 57%	F	0

Although **unlikely**, we reserve the right to modify the distribution of grades based on overall student performance in the course. Any modifications will be in your favor (e.g., "B" grades extending to 79%).

Exams: There will be two midterm exams, each worth 12% of the total points that can be earned in the course, to be given in class on Monday, 9/26, and Wednesday, 11/2. Each of these will cover approximately one-third of the course. The final exam on Wednesday, 12/14, 2:30-4:30 PM will be worth 20% of the total points, and will cover the last one-third of the course material and will also test your comprehensive understanding of the course material. These three exams will contain a combination of objective questions (e.g., multiple choice, matching, fill-in the blank), short essays, and long essays that require analysis and integration. Unless specified by the instructor, no material (other than pens, pencils, erasers, and Scantron forms) will be allowed during examinations. Exams taken in pen *may* be accepted for regrade requests.

Personal Response System (PRS) Scores: The Personal Response System is used to facilitate interactive learning in Biology 171. Students respond to multiple choice questions asked during class using the PRS transmitter. A histogram displayed on a screen at the front of the class summarizes the class answers to problems/questions posed by the instructor.

Biodiversity Assignment: Throughout the semester students will investigate 7 organisms, each representing a different phylum of biological diversity. Pairs of students will give an oral presentation on one organism to the rest of their lab section. At the end of the semester, each student will compile their 7 diversity logs and construct an evolutionary tree of these organisms depicting their hypothesized relationships and some of the characteristics that support these relationships. Presentation dates will be selected during lab. Please refer to the Biodiversity Assignment in your lab manual for further information on this activity. The Biodiversity Assignment will be worth 10% of the total grade.

Artificial Selection Assignment: Students will design their own artificial selection experiment using Wisconsin Fast Plants, *Brassica rapa*, as a model organism. Lab groups will be responsible for **ALL** aspects of this experiment including the initial planting, watering throughout the semester, selecting for particular traits, pollinating, growing offspring, collecting data, and writing up results in the form of a scientific paper. Individuals or Groups can be penalized for failing to provide proper care for their plants. This experiment begins during lab 2A and runs to the end of the semester. The Artificial Selection Assignment will be worth 10% of the total grade.

Laboratory Notebook: Students will organize their observations and experiments using a personal laboratory notebook. The notebook will be a permanent record of the work completed during Biology 171 and will be worth 10% of the total grade. It will be collected once at the end of Lab 8B and again at the end of Lab 16B.

Quizzes: TAs will administer a total of 12 quizzes in lab section. Some pre-lab assignments will count as quiz grades. Your two lowest quiz grades will be dropped from your total lab quiz score. Quizzes will be worth 15% of the total grade.

Student Participation: Two percent of the final grade will be based on the quality and quantity of each student's participation in discussion in both classroom and laboratory components of the course.

Field Trip Participation: Two percent of the total grade will be based on the quality of your participation at the four field trips in Biology 171. Full credit will be awarded to students who arrive prepared, participate fully, approach the activities with an open mind, and respect their peers.

Exam and lab make-up policy: Due to the difficulty of constructing alternative exams that are similar in coverage and difficulty to the original, no makeup examinations will be given in this course. In the case of **documented** emergencies or **documented** unavoidable conflicts, which must be approved by Dr. Walker **AND** Dr. Zacherl, the student will receive a grade for the missed midterm examination equal to the average

of the other two exams. Otherwise a grade of zero will be given. It is **YOUR** responsibility to contact Drs. Walker and Zacherl. The final exam may not be made up in this way.

Because laboratory sections of Biology 171 are fully enrolled and successful completion of labs will depend on groups working together over both short and long-term, missed laboratory exercises will be difficult to make-up; you must arrange to attend alternate sections with the TA of that section at least 12 hours **BEFORE** the section meets. **If you do not make prior arrangements, you will not be allowed to attend an alternate section.**

LATE ASSIGNMENTS: Unless otherwise stated, all assignments are due at the beginning of the class period. Work handed in after class begins will be considered late. Late work will have 10% of the maximum points for that assignment deducted per day or part thereof that it is late (with weekends counting as two days). Assignments over one week late will receive a zero. However, if there is a **documented**, serious reason for missing the assignment deadline, the assignment **MAY** be counted at the discretion of the instructor or TA. Students who miss in-class quizzes, PRS sessions, and laboratory quizzes will receive a score of zero. Students may not take these late or make them up.

ACADEMIC INTEGRITY: You are expected to take your responsibility as a student seriously. We also trust that you will maintain high levels of academic integrity and help your peers to do the same. All work handed in should be your own. Much of the work you will do in class is collaborative to some degree because you will be working in pairs or groups. However, the written parts of your report must be in your own words and indicate that you yourself have completed the work required. Any incidents of cheating or plagiarism will be treated seriously. Academic dishonesty includes but is not limited to the following: using or providing unauthorized aid during an exam or quiz, altering an exam for additional credit, or copying the work of another individual and claiming it as your own. Students who violate academic honesty policies will, on the first offense, receive an oral reprimand or a zero on the assignment. Students committing a second offense **WILL** receive a failing grade in the **ENTIRE** course. All cases of academic dishonesty will be reported to the Associate Dean of Student Affairs. For questions please see information on policies and the guide to avoiding plagiarism at the Dean of Students website:
http://www.fullerton.edu/deanofstudents/judicial/policies.htm

WITHDRAWAL FROM COURSES: We will follow CSUF policy regarding withdrawal from classes (UPS 300.016). 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.

TAKE HOME MESSAGE: Engage yourself in the study of biology in an energetic, sincere, cheerful, consistent, and cooperative manner. Keep up with the assigned work and make sure you are learning and understanding along the way. You will learn a lot and enjoy the course!

Schedule for Biology 171: Evolution and Biodiversity

	Date	Lecture	Week	Lab	Reading	Projects & Assignments Due
EVOLUTION MODULE	8/22	The Science of Life: Patterns and Processes	1A	Making observations in biology	Ch 1	
	8/24	Life is Related and has Changed Through Time	1B	Quantifying observations in biology	Ch 23	
	8/29	Natural Selection as a Mechanism for Change	2A	Artificial selection project I: planting and trait identification	Ch 23	
	8/31	Microevolution	2B	Organisms, biology and science as a process: Termite behavior I	Ch 24	Termite experimental design due by end of lab
	9/5	Labor Day no lecture	3A	No lab 1st half of the week		
	9/7	Changes in Populations	3B	Organisms, biology and science as a process: Termite behavior II	Ch 24	Artificial Selection: Experimental designs due
	9/12	Species and Speciation	4A	Artificial selection project II: Selection	Ch 25	Biodiversity Presentation Select Dates
	9/14	Introduction to Phylogenies	4B	Artificial Selection III: *Brassica* pollination **AND** Phylogenetics I	Ch 26	
	9/19	Reconstructing Phylogenies	5A	Phylogenetics II **AND** Microbes I	Ch 26	
	9/21	History of Life	5B	Microbes II **AND** Protists	Ch 26 Ch 2, pp.20-23	Biodiversity Presentation 1 Biodiversity Log #1
BIODIVERSITY MODULE	9/26	EXAM 1	6A	Plant diversity I: Investigations at the CSUF Arboretum		
	9/28	Bacteria and Archaea	6B	Prep for Desert Field Trip	Ch 27	
		Desert Field Trip		*9/30-10/1 OR 10/1-2*		Biodiversity Log #2
	10/3	Eukaryotic Origins	7A	Plant diversity II: Mosses to ferns	Ch 28	
	10/5	Life on Land: Opportunities and Challenges	7B	Plant diversity III: Gymnosperms and angiosperms	Ch 29	Biodiversity Presentation 2
		Desert Field Trip		*10/7-8 OR 10/8-9*		Biodiversity Log #2
	10/10	Seed Plants	8A	Desert Field Trip follow-up	Ch 29	Biodiversity Presentation 3
	10/12	Animal Body Plans: Size and Shape in Biology	8B	Flowers, fruits and seeds	Ch 31	Biodiversity Presentation 4 Biodiversity Log #3 Lab Notebooks due
	10/17	Parazoa and Radiata	9A	Animal diversity I: Porifera and Cnidaria	Ch 31	Biodiversity Presentation 5
	10/19	Lophotrochozoa	9B	Animal diversity II: Lophotrochozoa	Ch 32	Biodiversity Presentation 6 Biodiversity Log #4
	10/24	Ecdysozoa I	10A	Artificial selection IV: Establishing the next generation	Ch 32	Biodiversity Presentation 7
	10/26	Ecdysozoa II	10B	Animal diversity III: Arthropoda I	Ch 32	Biodiversity Presentation 8 Biodiveristy Log #5

	Date	Lecture	Week	Lab	Reading	Projects & Assignments Due
BIODIVERSITY MODULE	10/31	Deuterostomia	11A	Animal diversity IV: Arthropoda II	Ch 33	Biodiversity Presentation 9
	11/2	EXAM 2	11B	Animal diversity V: Vertebrates	Ch 33	
	11/7	Key Innovations in Vertebrate Evolution	12A	Artificial selection V: Measuring change	Ch 33	Biodiversity Presentation 10
	11/9	Colonization of Land by Vertebrates	12B	Artificial selection experiment VI: Data analysis	Ch 33	Biodiversity Presentation 11 Biodiversity Log #6
	11/14	TBA	13A	Explorations in Conservation Biology I	TBA	Biodiversity Presentation 12
	11/16	Co-evolution and Biodiversity	13B	Explorations in Conservation II Trip to Tucker Wildlife Sanctuary	Ch 55	Biodiversity Log #7 **11/18 5PM** Intro/Methods due: Artificial Selection
	11/21	FALL RECESS	14A			
CONSERVATION	11/23	FALL RECESS	14B			
	11/28	Distribution of Life on Earth	15A	Explorations in Conservation III	Ch 50	Intro & Methods Returned
	11/30	Biodiversity and Evolutionary Patterns	15B	Intertidal field trip preparation	Ch 55	
		Intertidal Field Trip		*12/2 **OR** 12/3, 2:30-5:00 PM*		
	12/5	Guiding Principles of Conservation Biology	16A	Intertidal diversity follow-up	Ch 55	Completed Artificial Selection Paper Due
	12/7	TBA	16B	Explorations in Conservation IV	TBA	Biodiversity overall tree due Lab notebooks due

12/14 Final Exam 2:30-4:30 PM Final is comprehensive: $^1/_2$ since Midterm 2 and $^1/_2$ on whole course

The information included below articulates how Biol 171 meets General Education requirement III.A.2.c:
Biology 171L covers the following goals for student learning within requirement III.A.2. (UPS 411.201):

1) To understand how different themes of science make connections within and between the different scientific disciplines. Examples of unifying themes covered include the following: Evolution, Patterns of Change, Science as Inquiry, Patterns of Change, and Science and Society.
2) To apply scientific methodology through active experimental methods and experiences (laboratory/activity).
3) To evaluate the validity and limitations of theories and scientific claims in interpreting experimental results.
4) To understand the dynamic and evolving nature of the sciences.
5) To recognize the importance of scientific paradigms and methods in understanding scientific concepts.
6) To solve theoretical or experimental problems that require knowledge of science concepts and scientific reasoning.
7) To understand the issues raised by science for contemporary society and to appreciate the relevance and application of science in everyday life.

The General Education writing requirement is met throughout the course. For example, the Artificial Selection assignment requires students to organize and express complex data collected in an ongoing experiment. Students write and receive repeated feedback on their writing for this project via the experimental design, written report Introduction and Materials, and complete write-up.