

Biological Sciences 2B

Fall 2017

Professors Johanna Schmitt and Sebastian Schreiber

INTRODUCTION:

Welcome to Biological Sciences 2B. BIS 2B is the second course in the Biological Sciences lower division core sequence that is designed to provide a foundation for study of modern biology for a broad range of majors. Whereas BIS 2A introduced you to the fundamental molecular, cellular, developmental, physiological, and genetic building blocks of living organisms, and the origins of life itself, BIS 2B picks up the story by examining ecological and evolutionary processes that shape biological diversity.

Specifically, this course covers the processes by which organisms have evolved over the several billion years of the existence of life on Earth (**evolution**) and the present-day processes by which those species interact with each other and the environment to create the patterns of distribution and abundance of species we see around us (**ecology**). As you will certainly see throughout the quarter, evolution and ecology are fundamentally linked: evolutionary history shapes a species' ecology, and present-day ecology can influence future evolutionary trajectories. This is why we present them together.

What is Ecology? Ecology is the study of the interactions (either between organisms or between organisms and their environment) that determine the distribution and abundance of organisms. The study of ecology involves feedbacks at multiple biological scales: the individual organism, a population (consisting of many individuals of the same species), the community (consisting of populations of many different species), and the ecosystem (the community plus the physical environment that surrounds it). Ecology is NOT about hugging trees and saving the whales. It IS about the scientific study of those whales and trees and the processes that determine where they occur on Earth and why they are more abundant in some locations than in others.

What is Evolution? Biological evolution is the process of genetic change in populations of organisms from one generation to the next. Evolutionary biology is the study of this process over multiple scales, from short-term evolutionary change within a single population to the origin of different species and the diversification of major groups of organisms over millions of years to create the incredible range of life forms living on Earth. There is overwhelming scientific evidence for evolution at all of these levels, and evolutionary theory is the organizing principle for modern biological science.

Both ecology and evolution are fundamentally quantitative and experimental sciences. Understanding the fundamental concepts will often require elementary mathematics and quantitative reasoning.

Student Learning Goals for Introductory Biology BIS 2B

At the end of this course, you should be able to:

1. Explain what climate is, what causes it, how it is changing, and how it influences the distribution and abundance of organisms.
2. Explain what biodiversity is and describe how it is measured.
3. Predict how human activities such as overharvesting, habitat destruction, and pollution will affect the diversity and composition of ecological communities and the evolutionary trajectory of species.
4. Describe the concept of a tradeoff and give an example, explaining how the tradeoff relates to the maintenance of species diversity in nature.
5. Use the fundamental principles of inheritance to explain the relationship between genotype and phenotype in parents and offspring.
6. Distinguish the processes that lead to limited and unlimited population growth and give examples of factors that limit growth for natural populations.
7. Predict the direction, magnitude and outcomes of natural selection given a set of biological starting conditions
8. Describe the contributions that different forms of natural selection and genetic drift make to evolutionary change
9. Use data from population genetics, natural selection, biogeography, and phylogenetics to explain how new species arise
10. Explain how competition, predation and mutualism each influence the distribution and abundance of species over time and space
11. Develop a conceptual framework for global carbon cycling that integrates photosynthesis, primary production, herbivory, decomposition, and the burning of fossil fuels.
12. Interpret graphs and data to evaluate scientific hypotheses, models and theory for any of the content-based objectives above (1-11).

CLASS MEETINGS:

Please arrive ON TIME to class. It is disruptive both to us and your fellow students when you arrive after lecture has started. If you are late, take a seat in the back as quietly as possible.

Section A: **Lectures** – M, W, F from 3:10 - 4:00 PM in Science Lecture Hall 123
 Discussions – Wednesday from 8:10-9:00 PM in Science Lecture Hall 123
 Final Exam – 8:00-10:00am on Wednesday December 13th

Section B: **Lectures** – M, W, F from 2:10 - 3:00 PM in Science Lecture Hall 123
 Discussions – Wednesday from 9:10-10:00 PM in Science Lecture Hall 123
 Final Exam – 8:00-10:00am on Friday December 15th

IMPORTANT: You must attend your own section! All sections are fully enrolled and seating is limited. Be warned that Section C lectures and discussions cover slightly different topics in a different order and may not be helpful for preparing for section A/B exams.

STAFF: Your instructors are Johanna Schmitt and Sebastian Schreiber, both Professors in the Department of Evolution & Ecology.

Office hours: Our office hours are always held in the Biology Learning Center (*aka* the BLC in 1089 Sciences Laboratory Building). Dr. Schmitt's office hours will be 1:30-2:30pm Tuesdays and 11:30am-12:30pm Wednesdays. Dr. Schreiber's office hours will be 9:30-10:30am Tuesdays and 10:30-11:30am Thursdays. **Please do come to office hours with your questions!** Office hours are a vastly underutilized resource, especially outside of the few days before an exam.

The **course coordinator** is Dr. Pat Randolph (office is 1019 SLB). You can reach him by e-mail (rprandolph@ucdavis.edu), telephone (530-752-1117), or visit his office hours in 1089 SLB. His office hours will be posted on the course website during the first week of the quarter

Meghan Munn (mmunn@ucdavis.edu) will **handle ALL enrollment questions**. She will hold office hours by appointment (530-754-5973). During the first week of the quarter, she will also be in the hall outside the labs (1080, 1088 and 1090 SLB) at the beginning of each lab, so look for her there.

Using email: If you have questions about the course material, quizzes, exams, etc., please post your question on the Canvas discussion board. This way everyone can benefit from seeing the questions and responses. If posting on the discussion board isn't appropriate, you can contact us by e-mail. In this event, please be sure to address your message to the appropriate person (Drs. Schmitt and Schreiber for questions concerning lectures and exams, your TA and Dr. Randolph for lab questions, and Ms. Munn for all enrollment questions). Be sure to put "BIS 2B" in your email heading to avoid our spam filters and be careful to follow the e-mail etiquette described at http://daviswiki.org/UCD_Email_Etiquette

ATTENDANCE AND ENROLLMENT:

The course is nearly full. If you have questions about the waitlist, you must contact Meghan Munn (see above). You must attend the lab and lecture section in which you are currently enrolled. **Don't be late to the laboratory; if you are late, and there is someone on the waitlist who is present and wishes to enroll, you will lose your place in lab and in the course.** If space is available, permission-to-add (PTA) numbers will be given out in lab.

If you wish to switch labs, you must identify someone who wishes to switch with you and both of you must come to see Meghan Munn in person to complete the switch.

Due to staff limitations, if you miss your lab for any reason, you will not be able to make it up later in the week in another lab section. There is simply no way for us to set up alternative lab periods. However, we drop the lowest lab score for the quarter, so if you miss one lab, it will not directly hurt your grade (see the lab manual and below for more details on grading). **You must take the practical examination in the section in which you are enrolled.**

THE BLC:

The Biological Learning Center (BLC) is in Room 1089 SLB. Instructors and teaching assistants hold office hours here, and additional reference material is available. This room is a student resource where individual help is available from instructors, and from displays and books. It is a good place to study, examine preserved specimens, meet other students, and keep up with class. Hours are posted on the course web page.

CLASS PARTICIPATION:

While we will not be using clickers in class, we do regularly pose questions to students during lectures which you should consider and answer in class. While these are not directly worth points we can tell you from experience that active participation in class enhances student understanding and allows you to better identify your own strengths and weaknesses.

GRADES:

Your grade in Biological Sciences 2B is based upon your grades on two cumulative lecture midterms (100 points each), one comprehensive final lecture exam (150 points), and performance in the laboratory (150 points). In addition, there will be 4 extra credit quizzes (5 points each): one during the first week, and one before each exam.

LECTURE EXAMS (100, 100, 150pts)	70%	350 pts
LAB	30%	150 pts
TOTAL	100%	500 pts
Lab Points Breakdown:		
8 Labs @ 15 pts		120 pts
Dropped lowest score		-15 pts
Lab practical		45 pts
Total		150 pts

There are no make-up exams in this course. In lieu of make-up midterms, we will offer every student the opportunity to drop their lowest midterm score, and weight the final exam more heavily (100 points midterm, 250 points final exam). We will automatically calculate your score both ways and your grade will be based on the higher score. If you miss a midterm exam, we will drop that 0 score. **Because of time and staffing constraints, there is no make-up or rescheduling of the final exam or the lab practical. No exceptions.**

Lecture exams consist of multiple choice and short answer questions. They are based upon lecture and discussion materials, study questions, and reading assigned for the lecture and discussion sections that supports material covered in class. Throughout the quarter, ***we will post to the class Canvas sample questions designed to give you a feel for both the form of the questions and the format of the exam.*** As these sample questions are not exhaustive, use them to think of what other important concepts were covered in lecture and what types of questions one might ask about them.

Please bring a pen, pencil, eraser, and photo identification to each examination.

If you have a question regarding the grading of the lecture exam, describe the problem or question in writing, in a clear, concise, and well-organized statement. You must not alter the original examination in any way before you submit it for a re-grade. Attach the exam to this cover letter and give it to the TA on duty in the BLC **within 5 working days** from the date the exam was returned to you. No corrections can be made after this time. Replies to re-grade requests will be available in the BLC when they are completed.

Extra credit quizzes will be administered online through Canvas. Each quiz will have to be completed during the announced time period. Once a quiz is closed, there will be no opportunities for retaking the quiz. As they are online, be sure that you have a good internet connection when taking them. The first quiz is intended to provide us with a baseline of your knowledge. Hence, as long as you complete it, you will get full credit. The remaining three quizzes are drawn randomly from a pool of questions relevant to the next exam. During its period of availability, you will have three tries per quiz. The best of your three scores for a given quiz will be added to your score for the exam associated with the quiz. The first quiz score will be added to your point total for the quarter i.e. it is not associated with a particular exam.

Grades will be determined by the percentage of the total points received in the course: there are 500 total points not counting the extra credit points from the quizzes.

A-: $\geq 90\%$ (450 pts.)

B-: $\geq 80\%$ (400 pts.)

C-: $\geq 70\%$ (350 pts.)

D: $\geq 60\%$ (300 pts.)

F: $< 60\%$

Grades are assigned on a percentage basis, not on the basis of a “curve.” This means that you are not competing with other students for each grade. We encourage you to help one another learn the material, to study together, and to work together in the laboratory portions of the course. If we didn’t think our material was important, we wouldn’t cover it in lectures, labs, or discussions, so we expect you to understand at least 90% of the material to get a high grade. It is possible that we will slightly lower the cut-offs, but we will not raise them.

STUDENT CODE OF CONDUCT AND ACADEMIC DISHONESTY:

Be sure to read and understand the UC Davis Code of Academic Conduct. You can find it at: <http://sja.ucdavis.edu/cac.html>. The more general UC Davis Student Code of Conduct also applies: <http://sja.ucdavis.edu/student-conduct-standards.html>. We take any form of academic dishonesty or misconduct very seriously and report all instances we become aware of directly to Student Judicial Affairs. **Be sure you understand what constitutes misconduct-- ignorance of the rules is no excuse.** The use of any electronic devices (including, but not limited to, calculators, translators, cell phones, cameras and iPods) during an exam is forbidden and if you are found using one during an exam we will assume that you are cheating. We note that the University also considers unauthorized selling or online posting of course materials to be a violation of the student Code of Conduct (Section 102.23). Moreover, you should know that obtaining notes or slides from other offerings of BIS 2B is unlikely to help you because we post exam study questions and lectures slides on the course Canvas page that are specific to our offering of BIS 2B this quarter.

CLASSROOM ETIQUETTE:

There are certain rules of behavior that we expect to be followed in the classroom. UC Davis’ office of Student Judicial Affairs has published a very thoughtful document on expected behavior and etiquette at: https://daviswiki.org/UCD_Classroom_Etiquette. Below, we have reprinted (slightly modified) the points we have found to be most applicable to the lecture and discussion in BIS 2B, combined with other suggestions we’ve received from students.

Entering/Exiting Class:

- Please arrive on time to class and stay for the entire class period. Late arrivals and early departures are disruptive.
- If, despite your best effort, you arrive late, please quietly take a seat at the back of the classroom. In the rare event that you must leave class early (e.g. for a medical appointment), sit close to the rear door and one of the aisles so that you can leave as unobtrusively as possible. If you can't be there on time or must always leave early because of a class or work conflict, don't take the class.
- When class begins, please stop your conversations.
- Wait until class is completely over before putting your materials away in your backpack, standing up, or talking to friends. We make every effort to keep our lectures within the allotted 50 minutes. Occasionally, we may be in mid-thought at the 50-minute mark and may take an additional minute to finish that thought. Other times, we might finish at 49 minutes. Please wait until we indicate that class is over before packing your backpack and departing.

Electronic Devices:

- No taping, filming, or photography in class without our prior permission (whether by camera, cell phone, or other means). We provide podcasts of all lectures and discussions, and nearly complete versions of our lecture slides, so this shouldn't be necessary.
- Cell phones should be turned off. No talking on cell phones or text messaging, web surfing, or emailing on laptops, tablets or smartphones during class. Wait until after class to return any calls received.
- Please be respectful of your fellow students and use your laptop or tablet only for course related activities. Maybe you think you can multitask and watch that cute cat video on YouTube while processing our lecture, but *research studies show that students who multitask during lecture perform worse in the course- and so do students sitting near the multitasker!*

LABORATORY:

The laboratories for this class were designed to complement topics presented in lecture. Details of the lab are provided in the lab manual (see required texts, below). Labs are worth 15 points each: 5 points for the pre-lab and 10 points for the post-lab exercise. **Pre-Labs must be completed and turned in by 9AM on Monday of the lab week. If you do not turn in the pre-lab, you will not be allowed to attend lab and will forfeit all points for the week.** You are encouraged to discuss the pre-lab in a study group, but written answers should be entirely your own. There is no pre-lab for the first week of class.

Pre-lab submission will be done electronically via Canvas. Log on to the BIS 2B page on Canvas and then click on the link for the pre-lab. Instructions regarding this were emailed to all enrolled students prior to the beginning of the quarter.

Because of the nature of the labs and because all lab sections are full, ***if you miss your lab for any reason you may not attend another lab that week. There are no makeups, however we will drop your lowest score so if you miss a lab that will be the one dropped score.***

BIS 2B has a Course Material and Service Fee to cover the costs associated with the lab/course. Students who are unable to afford the fee may seek a waiver from the department. The waiver form is available at the front desk in the EVE Office, Rm 2320 Storer Hall. Completed forms must be returned to the EVE Office before the 20th day of instruction. Only in extreme cases of financial hardship, as of yet unaddressed through financial aid, can the fee be waived. Documentation is required. Further instructions are listed on the waiver form. You are encouraged to seek financial aid assistance from the Financial Aid Office. Information is available on the EVE department website www.eve.ucdavis.edu with full detail on the costs associated with each course/fee and an appropriate departmental contact should there be additional questions under the "CMSF Info" tab.

TEXTBOOKS AND READING:

Life: the science of biology, 11th edition, by Sadava, Hillis, Heller, and Hacker. We have arranged with the publisher to produce a custom, loose-leaf version of this text that will include all the textbook reading assignments for this course and BIS 2A and BIS 2C, at a significantly lower cost than the full book. Of course, you are welcome to purchase the full textbook; all assignments will be in that book too. You also **must** buy the Intro. to Biology Laboratory Manual for Biological Sciences 2B—a used copy of the lab manual is not acceptable because there are tear-out exercises in the lab manual.

We will post PDF versions of the slides that will be shown in lecture, the evening before class on the course's Canvas webpage. These are meant to help you follow the lecture and think about the material so that you do not feel you should spend all your class time copying from our slides. However, some of the key points on the slides we show in lecture may be omitted from your handouts and you will need to attend lecture to obtain a full understanding of the main concepts. We will not post complete versions of the slides after lecture, so don't ask. If you do have to miss class, you'll need to check with a classmate, come to office hours, and/or listen to the podcasts. Study questions and other supplementary materials will also be available on the course website.

Assigned Readings:

Required readings are listed on the class syllabus (see below). You should skim these before lecture so that the terms and concepts will be somewhat familiar to you as you listen to the lecture. After the lecture, read them more carefully, centering your reading on the topics covered in lecture, laboratory and discussion sections.

THERE IS A GREAT DEAL OF MATERIAL IN THIS COURSE THAT IS NOT EXPLICITLY COVERED IN THE TEXTBOOK. There is simply no available general biology textbook that has kept pace with modern ecology and evolutionary biology. **In this class, you will need to rely on lecture attendance to do well.** Lecture handouts, notes, podcasts, and the website are meant as supplements to help you get more out of the lecture itself, and are not meant as substitutes for attendance.

If the material in the textbook is unrelated to material covered in the lecture or discussion sections, then it is unlikely to appear on exams. READ SELECTIVELY, and use your textbook as a reference to help you learn concepts, terms and ideas introduced in other portions of the course. If you are having difficulty with lecture material, don't let new terms in the reading confuse you further; focus on lecture/discussion material first.

We do make an effort to record every lecture and make them available on the class website as a podcast. These are usually available within a day or so after each lecture is given. Despite our best intentions, the equipment does occasionally fail, so you should not rely on these to take the place of attending lecture. Podcasts are best used to help you review a topic that you found difficult or confusing when you heard it in lecture the first time.

LECTURE SCHEDULE FOR FALL QUARTER 2017

	LECTURE TOPIC	WHO?	READING	LAB TOPIC
W 27 Sep	1.CLASS INTRODUCTION	JS	Ch. 1, 54.1	
W 27 Sep	EVENING: 2. MEASURING & VALUING BIODIVERSITY	SS		
F 29 Sep	3.CLIMATE AND BIOMES	SS	Ch. 53.2,53.4	
M 2 Oct	4.FUNCTIONAL DIVERSITY 1	SS	Ch. 30.3,35.1-4 52.4	Biological diversity
W 4 Oct	5.FUNCTIONAL DIVERSITY 2	SS	Ch. 38.1-3 39.3-5	
W 4 Oct	EVENING: 6. FUNCTIONAL DIVERSITY 3	SS	Haldane Reading	
F 6 Oct	7.POPULATION GROWTH 1	SS	Ch. 54.1-2,4	
M 9 Oct	8.POPULATION GROWTH 2	SS	Ch. 54.1-2,4	Adaptations for resource acquisition
W 11 Oct	9. POPULATION GROWTH 3	SS	Ch. 54.1-2,4	
W 11 Oct	EVENING: 10. NATURAL SELECTION 1	JS	Ch. 20.1, 21.1	
F 13 Oct	11.NATURAL SELECTION 2	JS	Ch. 20.2, 20.4	
M 16 Oct	12.NATURAL SELECTION 3	JS	Ch. 20.4, 20.6	Population growth
W 18 Oct	13.LIFE HISTORY EVOLUTION	SS	Ch. 30.4 Ch. 54.3	
W 18 Oct	EVENING: 14. PROBLEM SOLVING & REVIEW	JS & SS	Practice questions	
F 20 Oct	MIDTERM EXAM 1			

	LECTURE TOPIC	WHO?	READING	LAB TOPIC
M 23 Oct	15. MENDELIAN GENETICS 1	JS	Ch. 11.4-11.5, 12.1	Natural selection
W 25 Oct	16. MENDELIAN GENETICS 2	JS	Ch. 12.2-12.4	
W 25 Oct	EVENING: 17. PROBLEM SOLVING	JS	Ch. 12.1-12.4	
F 27 Oct	18. POPULATION GENETICS 1	JS	Ch. 20.2-20.3	
M 30 Oct	19. POPULATION GENETICS 2	JS	Ch. 20.3	Pop. Genetics
W 1 Nov	20. POPULATION GENETICS 3	JS	Ch. 20.4	
W 1 Nov	EVENING: 21. POPULATION GENETICS 4 & PROBLEM SOLVING	JS	Practice questions	
F 3 Nov	22. SPECIES INTERACTIONS & COEVOLUTION 1	SS	Ch. 55.1,3	
M 6 Nov	23. SPECIES INTERACTIONS & COEVOLUTION 2	SS	Ch. 55.2	Succession
W 8 Nov	24. SPECIES INTERACTIONS & COEVOLUTION 3	SS	Ch. 55.2	
W 8 Nov	EVENING: REVIEW	SS/JS	Practice questions	
F 10 Nov	HOLIDAY: VETERAN'S DAY			
M 13 Nov	MIDTERM EXAM 2			Trophic interactions
W 15 Nov	25. SPECIES INTERACTIONS & COEVOLUTION 4	SS	Ch. 55.4	
W 15 Nov	EVENING 26. SPECIATION 1	JS	Ch. 21.1, 22.1-22.3	
F 17 Nov	27. SPECIATION 2		Ch. 22.4-22.5	
M 20 Nov	28. COMMUNITY ECOLOGY 1	SS	Ch. 56.1-4	

	LECTURE TOPIC	WHO?	READING	LAB TOPIC
W 22 Nov	HOLIDAY: THANKSGIVING			
F 25 Nov	HOLIDAY: THANKSGIVING			
M 27 Nov	29. COMMUNITY ECOLOGY 2	SS	Ch. 56.1-4	Incipient speciation
W 29 Nov	30. ECOSYSTEMS & GLOBAL ECOLOGY 1	SS	Ch. 56.5	
W 29 Nov	EVENING: 31. ECOSYSTEM & GLOBAL ECOLOGY 2	SS	Ch. 57.1-5	
F 1 Dec	32. SPECIES DIVERSITY AND EXTINCTION	JS	Ch. 58	
M 4 Dec	33. A BRIEF HISTORY OF LIFE 1	JS	Ch. 24	Lab Final
W 6 Dec	34. A BRIEF HISTORY OF LIFE 2	JS	Ch. 24	
W 6 Dec	EVENING: FINAL EXAM REVIEW	JS/SS	Ch. 59	
F 8 Dec	35. COURSE SYNTHESIS: the ecological theater and the evolutionary play	SS/JS	Ch. 25, 58	

A DOZEN HINTS FOR SUCCESS IN BIS 2B

1. Take YOUR OWN CAREFUL notes in lecture. This course relies heavily on lectures and discussion, and much less on the textbook. We do post nearly complete copies of our lectures on the course site, but attending class, avoiding electronic distraction, and taking your own notes, using the lecture handouts as a reference, will improve your performance in the course. *Some research shows that students may learn more effectively from handwritten notes vs. typing on laptops.*
2. Go over your notes for clarity soon after the lecture. Were there examples to illustrate the point? What do the graphs mean? Can you restate what the graphs are telling you in words? If not, you don't understand them.
3. Complete the readings before the lecture. Being familiar with terms and concepts will help you get more out of lecture.
4. Read and understand the handouts.
5. Do the study questions. WE CANNOT STRESS THIS STRONGLY ENOUGH. Really. We do use these questions to help to write our exams. You should use them to study for our exams. Be sure to do them at least a week before the exam so you can bring questions to office hours and review sessions. Its ok to work in a group on these but make sure that YOU can answer EACH question satisfactorily ON PAPER, not just in your head. We are forced to grade what you put on paper, not what you think is in your head, so you might as well get some practice at putting your thoughts to paper.
6. Visit the BLC or ask the TA or the lecturer for help as soon as you realize you have a question about something. Instructor office hours are packed with 50 or more students in the days before an exam... getting individual attention at that point is difficult.
7. Spend all the laboratory time focused on the lab itself, and the goals of the lab. Don't let yourself get distracted unless you are sure you have time. Before you leave, make sure you have achieved all of the goals of the lab, which are clearly listed at the beginning of each lab in your lab manual.
8. Find out what you had wrong on each exam, and why it was wrong. Learn the right answer (the course is cumulative so this will help with the final exam).
9. Memorizing the material is pretty much futile. Make sure you understand the concepts, and the "facts" will make themselves clear, especially when you're under pressure. For example, it is much easier to remember the necessary and sufficient conditions for natural selection to occur if you understand the mechanism of natural selection.
10. Keep up with the course. Lectures cover a lot of material, they build on each other (that's the point!), and once you're behind it will be difficult to recover.
11. Please use an appropriate, informative heading starting with "BIS 2B" in any e-mail you send to course staff or faculty so it won't be deleted as spam.

12. Use appropriate [email etiquette](#). Do not send us e-mails that start with, "Hey!" We like it when you use our names.