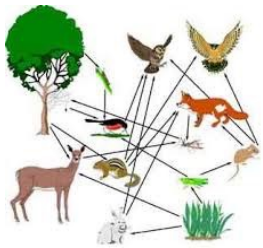
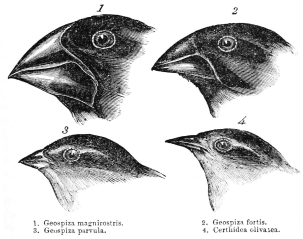


BI 213 General Biology III: Populations
Syllabus for Spring 2017
Instructor: Dr. Cristin Hulslander



Course Overview

In this third term of the general biology sequence we build on concepts of how cells and organisms function to study the patterns and mechanisms of evolutionary change over the past 4.5 billion years that have led to the diversity of life that exist on earth today. We begin by examining mechanisms that cause genetic change in populations over time with a special focus on natural selection. We then examine the species concept and look at patterns of evolutionary change over long time periods. In the second half of the term we examine ecological theory including different models of population growth and factors that regulate population growth in various organisms. We study ways in which two or more species interact and apply these ideas to current issues such as invasive species and loss of biodiversity. We end the term by examining ecosystem processes such as energy flow and nutrient cycling between various ecosystem components. Students participate in a field trip to collect data on plant diversity in a local forest which is used as the basis of understanding succession and diversity.

The goals for BI 213 fall into two general categories: (1) to learn the foundational concepts related to evolution and ecology (2) to build on the skills developed in BI 211, including the use of analytical thinking and the development of communication skills.

Concept-based goals:
1. To identify the mechanisms of that cause biological evolution in populations; to identify and explain the tenets of natural selection.
2. To apply the Hardy-Weinberg model to populations to investigate evolution.
3. To understand the connections between some of the major events in the history of life on earth.
4. To apply mathematical models to understand growth in populations; to describe the factors involved in regulating population growth.
5. To identify the important types of species interactions, such as competition and predation, that are important for shaping biological communities.
6. To define ecosystem productivity; describe and illustrate the flow of energy through ecosystems.
7. To describe and illustrate the major stores and fluxes in biogeochemical cycles.
8. To understand some of the ways in which humans have impacted the natural world.

Skill-based goals:
1. To develop competency in the basic terminology and methodologies used in the biological sciences.
2. To learn the process of scientific inquiry and its applications.
3. To learn how to learn about biology.
4. To learn to communicate knowledge, ideas and reasoning clearly and effectively in oral and written forms appropriate to the biological sciences; to prepare an oral presentation and practice public speaking.
5. To become familiar with the use of science relevant search engines, and learn to identify primary work; to develop the ability to think critically about information, evaluate the validity of arguments, and weigh the merits of disparate scientific conclusions.
6. To experience the collaborative nature of the biological sciences.

Course Format

Lectures (Monday, Wednesday and Friday, 10:00-10:50 in 150 Columbia)
You should do the assigned readings before coming to lecture. During some of the lectures there will be activities that will help you to learn concepts; these will often be done collaboratively with students discussing the problem together for a few minutes before each independently writes a solution. You will not turn these in but your active participation will help you to better understand the material and prepare you for exams.

Laboratories (Wednesdays, Thursdays in 5 Klamath)
We consider the labs to be an integral part of the course. We have tried to design active learning experiences that will broaden your understanding of what ecology and evolution are about. There will be labs dealing with population genetics, phylogenetics, biodiversity, and behavior. Lab handouts will be turned in at the end of each lab or at the beginning of your lab the following week (due date for each lab will be announced in lab). Each lab will be graded on a 5 point scale. Part of this grade will be based on participation in lab. Most labs cannot be made up because they involve special material or equipment. Late lab reports will not be accepted. If you let us know in advance about a lab you cannot attend, it may be possible to attend another lab sections with permission from the instructors.

Problem Solving Sessions (held during weeks problem sets are due, time and location TBA)
The single biggest problem students have in general biology is solving the kinds or problems presented in homeworks and exams. These are similar to the kinds of questions that biologists ask; they can't be solved by memorization of facts. In the problem solving sessions, we will go over practice homework questions and discuss ways to approach these problems. Although attendance is not required, we strongly encourage you to attend the session on a regular basis if your schedule permits, or to regularly attend the office hours of one of the GEs, or tutoring session of one of the Biology Tutor for Undergraduates (BTUs).

Office Hours and Tutor Sessions Times will posted online and announced in lecture during week 1.

Problem sets (practice and graded) There will be practice problems regularly posted to canvas (postings will be announced in class and online). We will help you to understand how to solve these problems in office hours, tutor sessions, and problem solving sessions. The practice problems are very similar to the types of questions you will see on the exams (in fact, most of the problems are from past exams). The practice problems are designed to help you master the material needed to successfully solve the graded problem sets.

There will be five graded problem sets posted online from Tuesday 5 p.m. to Thursday 7 p.m. You will submit your answers to these graded questions online. No late homeworks will be accepted. The solutions to each problem set will be posted online following each problem set deadline. You must do your own work on these graded questions. Copied work will be treated as academic dishonesty.

Clickers (Personal Response Systems) Clickers will be used in almost every class to encourage participation and to provide valuable feedback to instructors and students. Each student is expected to purchase a clicker for use in this class. You must register your clicker on the course Canvas site. Points will be earned two different ways: (1) 2-point questions, 2 points will be awarded based on participation alone, not on whether the question is answered correctly; (2) 4-point questions: 4 points for correct answer, 2 points for incorrect answer. Total percent for the clicker portion of your grade will be based on 85% of the total possible points: your clicker grade = total points earned/85% of total possible.

Project You will investigate an issue in ecology or evolution and give an oral group presentation in lab during week 9 or 10. Projects, worth 20% of your grade, will consist of 1) an annotated bibliography done by each person individually (worth 10% of your grade), 2) an oral group presentation (worth 10% of your course grade). Late work on the first part will be accepted up to one week but discounted 2% for each day (including weekends) that it is late. Each group will present their project in lab. **There will be no late presentations.**

If you are retaking this course, you will not be allowed to resubmit issues project work from the previous time you took Bi213. The work you do this term must be original.

Field Trip Each student will take a field trip to Fall Creek to investigate succession of woody plants in a local forest. The material covered on the trip is an integral part of the course. If you cannot attend the trip, you will be given an alternative assignment (description will be available online): a 4-5 page paper on plant succession in Cascade forests. Thursday and Friday trips depart at 1 p.m. and return by 7 p.m; Saturday trips depart at 10 a.m. and return no later than 5 p.m. Field trip sign-up will take place during lab in week 4.

Exams There will be three exams: two midterms and a final. All exams will be the same format: mostly short-answer. The final is cumulative. The exams will cover material from all aspects of the course including lectures, labs, readings and homework problems. Exams will be designed to probe a deep understanding of the concepts and principles discussed, and an ability to apply the concepts to novel situations rather than a memorization of detail. Exams cannot be made up. Exams are graded by the GEs under the supervision of the faculty. To promote consistency, a single person grades each question. Everyone is required to take the final exam which is on **Monday June 12**. **There will be no early or late exams given.**

Exam regrade policy To be fair to all students, it is essential that all exams be graded according to the same criteria. If you wish to submit a midterm for a regrade, you must use the following guidelines. First, refer to the exam key available online to see how closely your answer(s) match the key. If you still wish to have a midterm exam answer regraded, you must submit a written statement within one week of the return of the exam, along with your original exam, explaining specifically why your answer merits a higher score. Keep in mind that we will regrade the entire exam and a regrade may result in a higher, lower, or unchanged score. Please do not abuse this system. We reserve the right to eliminate this option at our discretion.

Evaluation

Laboratory activities (1% each)	7%
Problem sets (graded) (1% each)	5%
Clicker questions	5%
Field Trip	3%
Exams	60%
midterm exams (15% each)	
final exam (30%)	
Issues Project	20%
annotated bibliography (10%)	
oral presentation to peers in lab (10%)	

Learning Environment The University of Oregon is working to create inclusive learning environments. Please notify us if there are aspects of the instruction or design of this course that result in barriers to your participation. You may also wish to contact the Accessible Education Center in 164 Oregon Hall at 346-1155 or uoaec@uoregon.edu. If you have a documented disability and anticipate needing accommodations in this course, please talk to your instructors during the first week of class. Please request that the Counselor for Students with Disabilities send a letter verifying your situation.

Professional conduct Please arrive to lab and lecture on time and stay until class is over because late arrivals and early departures make unnecessary noise and disruption that distracts your classmates.

Please do not chat during lectures except when asked to discuss problems with other students. This is disruptive to those around you and inhibits their chance to learn; it's not fair to your classmates. Likewise, using your cell phone, tablet, or laptop to check email, facebook, surf the web etc. is disruptive to those around you. While taking notes and following along the lecture notes on your tablet or laptop is often helpful for learning, extraneous images on computer screens can be a great distraction for those behind you and simply is not fair to them.

Cheating devalues the reputation of our institution, its faculty, its students, and the significance and value of your academic degree. Academic misconduct is particularly unfair for students who do their work with integrity and honor. The University Student Conduct Code (http://policies.uoregon.edu/vol-3-administration-student-affairs/ch-1-conduct/student-conduct-code) defines academic misconduct. Students are prohibited from committing or attempting to commit any act that constitutes academic misconduct. For example, students should not give or receive (or attempt to give or receive) unauthorized help on assignments or examinations without express permission from the instructor. Students should properly acknowledge and document all sources of information (e.g. quotations, paraphrases, ideas) and use only sources and resources authorized by the instructor. If you have any question about whether an act constitutes academic misconduct, it is your obligation to clarify the question with the instructor before committing or attempting to commit the act. Additional information about a common form of academic misconduct, plagiarism, is available at http://researchguides.uoregon.edu/citing-plagiarism/plagiarism

We want you to learn and to do well in the course, but we will not tolerate academic dishonesty. Sanctions for academic dishonesty will be a lowering of the final grade or failure. If you find yourself in trouble, or if you are aware of academic dishonesty occurring, please talk to one of the instructors.

Personal crises do happen. If you are having difficulties that are interfering with your ability to do well in the class, please tell an instructor as soon as possible. We may be able to refer you to someone for help or to make special arrangements if the need is real and if you have done your best to deal with the situation in a timely manner. Don't hesitate to call the campus crisis center (541 346-3227) if you or a friend need assistance. Finally, we promise to respect you as students and as individuals, and ask that you return that respect to us and to your fellow classmates.

We support Title IX and have a duty to report relevant information. The UO is committed to providing an environment free of all forms of prohibited discrimination and sexual harassment, including sexual assault, domestic and dating violence and gender-based stalking. Any UO employee who becomes aware that such behavior is occurring has a duty to report that information to their supervisor or the Office of Affirmative Action and Equal Opportunity. The University Health Center and University Counseling and Testing Center can provide assistance and have a greater ability to work confidentially with students.

Lecture and Lab Schedule

Week	Date	Lecture Topic	Laboratory Topic
1	4/3 4/5 4/7	L1: Evolutionary processes; population genetics L2: Population genetics continued L3: Natural selection: case study Darwin's Finches	Lab 1 1) Population genetics: part 1 2) Fern spore inoculations
2	4/10 4/12 4/13 4/14	L4: Natural selection continued L5: Evolutionary processes wrap up **Problem set 1 due by 7 p.m Thursday (canvas)** L6: Defining species & speciation	Lab 2 1) Population genetics: part 2 2) Select issues project topic
3	4/17 4/19 4/21	L7: Evolutionary trends in the plant kingdom L8: Using phylogenetics to understand evolution I L9: Using phylogenetics to understand evolution II	Lab 3 Plant evolution & diversity
4	4/24 4/26 4/27 4/28	L10: History of life on Earth L11: Behavioral ecology: social behavior **Problem set 2 due by 7 p.m Thursday (canvas)** L12: Behavioral ecology: social behavior con't. .	Lab 4 Phylogenetic analysis of plant diversity **** Project annotated bibliography due at beginning of lab**
5	5/1 5/3 5/5	**Midterm Exam on L1-10** L13: Populations: exponential growth L14: Populations: logistic growth	Lab 5 1) Honey bee behavior 2) Plan for field trip to Fall Creek
6	5/8 5/10 5/11 5/12	L15: Populations: continued L16: Communities: species interactions **Problem set 3 due by 7 p.m Thursday (canvas)** L17: Communities: competition	No regular lab Field trip Thurs, Fri & Sat
7	5/15 5/17 5/19	L18: Communities: consumption L19: Communities: keystone; species introductions L20: Communities: ecological succession	No regular lab Field trip Thurs, Fri & Sat
8	5/22 5/24 5/25 5/26	**Midterm Exam 2 on L11-19** L21: Communities: biodiversity, conservation biology **Problem set 4 due by 7 p.m Thursday (canvas)** L22: Communities: conservation biology II	Lab 6 Project presentation preparation
9	5/29 5/31 6/2	**Memorial Day no class** L23: Ecosystems: productivity L24: Ecosystems: energetics	Lab 7A Project presentations (only required to attend if this is the week you are presenting)
10	6/5 6/7 6/8 6/9	L25: Ecosystems: nutrient cycles, nitrogen cycle L26: Ecosystems: carbon cycle **Problem set 5 due by 7 p.m Thursday (canvas)** L27: Global change	Lab 7B Project presentations (only required to attend if this is the week you are presenting)
Finals	6/12	**Monday at 10:15 -12:15**	

Course Materials

Course Packet Required, available from the Duck Store. This packet contains instructions for the issues project and handouts you will need for labs.

Calculator You will need a scientific calculator capable of doing natural logarithms and square roots for use on homework problems, in lab, and on exams.

iClickers There will be clicker questions in most lectures, including the first day of class.

Textbook The text, *Biological Science,* 5th or 6th ed. recommended, by Scott Freeman, should be used as a general reference. The readings include background material useful for preparing you for lecture and for studying for exams. We don't expect you to remember all the details in the text. A good strategy would be to skim over the entire chapter first, concentrating on the major concepts, then to read more carefully the specific pages that are assigned. There are copies of both editions of the text on reserve in the Science Library.

Lecture	Assigned readings for Freeman 5th edition	Assigned readings for Freeman 6th edition
1 & 2	Ch 26: pgs. 465-472 (population genetics) Ch 25: pgs. 472-486 (population genetics and forces of evolution)	Ch 23: pgs. 456-462 (population genetics) Ch 25: pgs. 462-477 (population genetics and forces of evolution)
3 & 4	Ch 25: pgs. 444-452, 453-462 (evolution and natural selection) Ch 25: pgs. 454-459 (natural selection)	Ch 22: pgs. 435--451 (evolution and natural selection)
5	Ch 30: pgs. 554-555 (sickle-cell anemia & malaria)	Ch 27: pgs. 540-541 (sickle-cell anemia & malaria)
6	Ch 27: pgs. 489-493 (species concepts) Ch 27: pgs. 494-502 (speciation)	Ch 24: pgs. 480-485 (species concepts) Ch 24: pgs. 485-493 (speciation)
7	Ch 31: pgs. 580-599, 601-609 (evolution of land plants)	Ch 28: pgs. 565-587 (evolution of land plants)
8 & 9	Ch 28: pgs. 505-511 (phylogenetics) BioSkills 7: pgs. B10-B11 near back of book (reading a phylogenetic tree)	Ch 25: pgs. 496-503 (phylogenetics) BioSkills 13: pgs. 47-48 (reading a phylogenetic tree)
10	Ch 27: pgs. 513-516 (life's time line), 518-523 (Cambrian explosion and extinction episodes) Ch 30: pgs 559-563 (origin of eukaryotes, multicellularity)	Ch 25: pgs. 504-506 (life's time line), 509-513 (Cambrian explosion and extinction episodes) Ch 27: pgs 546-550 (origin of eukaryotes, multicellularity)
11	Ch 53: pgs. 1082-1085, 1095-1098 (intro to behavioral ecology & altruism)	Ch 50: pgs. 1051-1054, 1064-1067 (intro to behavioral ecology & altruism)
12	Ch 53: pgs. 1091-1095 (communication in bees & honest vs. deceitful communication)	Ch 50: pgs. 1061–1064 (communication in bees & honest vs. deceitful communication)
13	Ch 54: pgs 1101-1108 (population growth models)	Ch 51: pgs 1070-1079 (population growth models)
14 & 15	Ch 54: pgs 1109-1112 (regulation of population growth)	Ch 51: pgs 1080 (regulation of population growth)
16	Ch 55: pgs. 1123-1135 (introduction to community ecology, species interactions)	Ch 52: pgs. 1092-1103 (introduction to community ecology, species interactions)
17	Ch 55: pgs. 1125-1128 (competition)	Ch 51: pgs. 1094-1097 (competition)
18	Ch 55: pgs 1128-1133	Ch 51: pgs 1081-1083; 1098-1101 (population dynamics; consumption)
19	Ch 55: pgs. 1137-1138 (keystone species) Ch 57: pgs. 1181 (species introductions)	Ch 52: pgs. 1104–1105 (keystone species) Ch 54: pgs. 1148-1149 (species introductions)
20	Ch 55: pgs. 1135–1137,1138-1142 (succession)	Ch 52: pgs. 1103-1111 (succession)
21 & 22	Ch 55: pgs. 1142-1145 (biodiversity and biogeography) Ch 57: pgs. 1172-1182	Ch 52: pgs. 1111-113 (biodiversity and biogeography) Ch 54: pgs. 1139-1159
23	Ch 52: pgs. 1068-1079 (skim descriptions of aquatic and terrestrial ecosystems) Ch 56: pgs. 1148–1149, 1153-1156 (introduction to ecosystem ecology, productivity)	Ch 49 pgs. 1039-1048 (skim descriptions of aquatic and terrestrial ecosystems) Ch 53: pgs. 1116-1117, 1153-1156 (introduction to ecosystem ecology, productivity)
24	Ch 56: pgs. 1149-1153 (ecosystem energetics)	Ch 53: pgs. 1117-1123 (ecosystem energetics)
25	Ch 56: pgs. 1156-1162 (biogeochemical cycles; focus on nitrogen cycle)	Ch 53: pgs. 1123-1129 (biogeochemical cycles; focus on nitrogen cycle)
26	Ch 56: pgs. 1156–1162 (biogeochemical cycles; focus on carbon cycle)	Ch 53: pgs. 1123-1129 (biogeochemical cycles; focus on carbon cycle)
27	Ch 52: pgs. 1073-1074 (how climate change affects ecosystems) Ch 56: pgs. 1163-1169	Ch 53: pgs. 1129–1136 (how climate change affects ecosystems)

Lecture	Assigned readings for Freeman 4th edition
1 & 2	Ch 25: pgs. 435-440 (population genetics) Ch 25: pgs. 440-452 (population genetics and forces of evolution)
3 & 4	Ch 24: pgs. 414-424, 429-432 (evolution and natural selection) Ch 24: pgs. 424-428 (natural selection)
5	Ch 29: pgs. 520-521 (sickle-cell anemia & malaria)
6	Ch 26: pgs. 458-462 (species concepts) Ch 26: pgs. 462-471(speciation)
7	Ch 30: pgs. 549-564, 569-577 (evolution of land plants)
8 & 9	Ch 27: pgs. 474-479 (phylogenetics) BioSkills 3: pgs. B4-B6 near back of book (reading a phylogenetic tree)
10	Ch 27: pgs. 481-484 (life's time line), 486-492 (Cambrian explosion and extinction episodes) Ch 29: pgs 526-529 (origin of eukaryotes)
11	Ch 51: pgs. 1019-1020, 1031-1034 (intro to behavioral ecology & altruism)
12	Ch 51: pgs. 1027-1031 (communication in bees & honest vs. deceitful communication)
13	Ch 52: pgs 1037-1044 (population growth models)
14 & 15	Ch 52: pgs 1044-1047 (regulation of population growth)
16	Ch 53: pgs. 1058-1070 (introduction to community ecology, species interactions)
17	Ch 53: pgs. 1059-1062 (competition)
18	Ch 52: pgs 1063-1066
19	Ch 53: pgs. 1072-1073 (keystone species) Ch 55: pgs. 1110-1111 (species introductions)
20	Ch 53: pgs. 1070-1072, 1073-1077 (succession)
21 & 22	Ch 53: pgs. 1077-1080 (biodiversity and biogeography) Ch 55: pgs. 1105-1114
23	Ch 50: pgs. 998-1008 (skim descriptions of aquatic and terrestrial ecosystems) Ch 54: pgs. 1083-1092 (introduction to ecosystem ecology, productivity)
24	Ch 54: pgs. 1084-1089 (ecosystem energetics)
25	Ch 54: pgs. 1092-1097 (biogeochemical cycles; focus on nitrogen cycle)
26	Ch 54: pgs. 1092-1097 (biogeochemical cycles; focus on carbon cycle)
27	Ch 50: pgs. 1011-1012 (how global warming affects ecosystems) Ch 54: pgs. 1098-1102