

BIO 252: Organisms, Evolution and Ecology
Spring 2008

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Course Homepage: <http://web.grinnell.edu/courses/bio/S08/Bio-252-02/> -- you will find useful links there, as well as links to electronic copies of all handouts and papers.

Office hours: Office hours: Mon 3:15-4:15 pm , Tues 8-9 am, Wed 10-11 am, Thurs 9-10 am, Fri 3:30-4:30 pm. Please contact me for appointments at other times, after consulting my schedule outside my door.

Staff: Sue Kolbe, Biology Department Lab Technician, kolbe@grinnell.edu
Margaret Funk, Mentor, funkmarg@grinnell.edu

COURSE DESCRIPTION

Bio 252 asks you to increase the spatial and temporal scale at which you study biology, relative to the course's major pre-requisite, BIO 251. The course retains a focus on organisms as the center of biology. As BIO 252's subject matter relies strongly on mathematical tools and reasoning, BIO 252 also has MAT 124 or 131 as a pre-requisite. We expect that by the time you take BIO 252 (and are veterans of BIO 150 and 251), you will be proficient at designing investigations, carrying out group projects, and communicating your findings in the same formats that professional biologists use. The course will also provide you with substantial experience in the statistical analysis of biological data.

This course focuses on fundamental activities of whole organisms, including resource acquisition and allocation, reproduction, information-transmission, growth, and (animal) movement. By placing those activities in their ecological and evolutionary contexts, BIO 252 addresses the question of *why* organisms possess the features they do in addition to the question of *how* those features operate. Meanwhile, BIO 252 requires that you understand the cellular and molecular underpinnings of organismal features and activities, as well as the consequences of those features and activities for the movement of material and energy through ecosystems. Thus the course emphasizes the synthesis and integration of concepts across multiple levels of biological organization. One way the course encourages this integration is by taking concepts, organisms, and even data sets from BIO 251 and applying them to larger-scale biological phenomena. For all Biology majors and also for others who take BIO 252 (e.g., pre-meds majoring in other subjects, Biological Chemistry majors) the 251-252 sequence showcases the unity and diversity of biology.

The scheduling of BIO 252 also encourages integration. Student investigations, class projects, exercises, paper discussions, lectures, etc. are scheduled in workshop format. Any given class period may involve any of these activities, and "labs" are not restricted to single 3-hr periods per week. Much of the course is structured around student-designed studies, student-collected data, and student-communicated findings.

Meetings: Monday 1:15-3:05, Wednesday 1:15-4:15 and Friday 1:15-2:05 in Science 1822 – later in the semester we will also be working at CERA. Each Friday, I will be giving you assignment sheets with details on reading assignments and study questions that will help you prepare for the week. (These can also always be found on the Class Web Page.) **It's important that you are prepared for every day of class.**

Texts: Molles *Ecology: Concepts and Applications, 4th Ed.* You may also want to get a copy of a general biology textbook, such as Campbell's *Biology* or Freeman's *Biological Science* (any edition). There are copies of such texts in the classroom (**DO NOT REMOVE THEM!**) and on reserve in Burling.

Evaluation: Grades will be based on the following assignments:

Quizzes (3)	30%
Acclimation paper	15%
Competition oral presentation	15%
Pre-lab assignments/homework/lab notebook	10%
Science journalism article	10%
Final Exam	20%

Quizzes and exams will evaluate your ability to use biological terms correctly, explain major ideas from the readings, interpret data and propose tests of hypotheses. If you do NOT do the assigned readings before coming to class, participate in class, do homework problems, and practice *writing* about the ideas after class, you will do poorly on the quizzes and exams!

Letter grades will be determined in the following manner:

93-100% A	87-90% B+	77-80% C+
90-93% A-	83-87% B	70-77% C
	80-83% B-	60-70% D
		< 60% F

I do not using a grading curve because I believe it discourages students from working together. I encourage you to form study groups, attend mentor sessions weekly, and work with me individually or in groups on the subject matter of the course. I do consider the effect of single assignments in lowering your grades (i.e., one bad day shouldn't matter) and take into account improvement over the semester. If you are worried about your performance in the class, please come talk to me during office hours. *I have very high expectations of you – and nothing is more important to me than helping you reach and surpass them.*

Policies: Written assignments are due by 1:15 on the due date. Late papers will be accepted with a penalty of 10%/day. Penalty-free extensions will be given in the case of illness documented by the health center. *Please let me know in advance if you need to miss class because of a conflict with an extracurricular or other activity. I will try to make reasonable accommodations, but not at the last minute!*

Learning disabilities – I am committed to accommodating all documented learning disabilities. Please speak with me early in the semester if there is a way I can facilitate your success in this course.

Schedule (subject to revision – consult weekly assignment sheets)

Week	Topics	Investigations	Assignments
1/21-25 I	<ul style="list-style-type: none"> Principles of organismal “design” Evolution & natural selection Animal form and function Muscles, skeletons. movement 	<ul style="list-style-type: none"> Frog biomechanics Scaling exercise 	<ul style="list-style-type: none"> Background on muscles & locomotion Scaling readings Jump-scaling article
1/28-2/1 II	<ul style="list-style-type: none"> Functional morphology and physiology 	Nematode Acclimation <ul style="list-style-type: none"> Class exercise Experimental planning 	<ul style="list-style-type: none"> Irschick & Losos 1998 Regression problem set Background reading on evolution
2/4-8 III	Physiological ecology <ul style="list-style-type: none"> Temperature and water relations Scientific writing Phenotypic responses to environmental conditions 	Nematode Acclimation <ul style="list-style-type: none"> group experiments 	<ul style="list-style-type: none"> ANOVA problem set Molles ch 1-5 Quiz I Fri 2/8
2/11-15 IV	Physiological ecology <ul style="list-style-type: none"> Morphology & resource uptake Resource allocation & trade offs 	Carbon dynamics <ul style="list-style-type: none"> RGR exercise 	<ul style="list-style-type: none"> Molles ch. 6 Background on Plant form & function Acclimation papers due Fri. 2/15
2/18-22 V	Reproduction and genetics	Carbon dynamics <ul style="list-style-type: none"> RGR exercise Experimental design of competition exp. 	<ul style="list-style-type: none"> Mendel 1865 Background on reproduction and genetics
2/25-2/29 VI	Genetics <ul style="list-style-type: none"> Transmission (Mendelian) Quantitative Molecular basis 	Carbon dynamics and competition <ul style="list-style-type: none"> Set up experiments Genetics exercises	<ul style="list-style-type: none"> Background on genetics (& review 251 material) Protas et al. 2006 Genetic stats problem set
3/5-9 VII	Population genetics <ul style="list-style-type: none"> Equilibrium Evolutionary “forces” Speciation 	Evolutionary forces exercises	<ul style="list-style-type: none"> Molles Ch. 8 Carroll & Boyd 1992 Quiz II Fri 3/9
3/12-16 VIII	Ecology, Natural Selection, and Speciation	Natural selection on gallmaker flies – field sampling and analysis	<ul style="list-style-type: none"> Gallfly article

SPRING BREAK – 3/17-3/30

3/31-4/4 IX	Population ecology Demography	Population and community dynamics exercises	Molles ch. 9-10
4/7-11 X	Population regulation and life histories	Competition experiment harvest and data analysis	<ul style="list-style-type: none"> • Molles ch. 11-12 • Quiz III Fri 4/11
4/14-18 XI	Species Interactions	Competition Oral presentations	<ul style="list-style-type: none"> • Molles ch. 13-15
4/21-25 XII	Community structure	CERA forest fire experiment -- class exercise	<ul style="list-style-type: none"> • Molles ch. 16-17 • Hutchinson et al. 2005
4/28-5/2 XIII	Ecosystem dynamics	Community structure and carbon dynamics exercise - CERA	<ul style="list-style-type: none"> • Molles ch. 18-20 • Knapp et al. 1999
5/5-9 XIV	Synthesis and integration	Peer review	<ul style="list-style-type: none"> • Gilbert 2001 Science journalism essay due Fri 5/9

Final exam Thursday March 15th 2-5 pm.