

## BIO 373 -- Mechanisms of Evolution -- Spring 2005

Prof. Jackie Brown

Office: Science 1201 Phone: x3096

Home: 236-7661, no calls after 10:00 PM and make sure it can't wait until morning!

Office hours: Mon 3-4pm, Tues 9-10 am; Thu 2-4 pm, Fri 3:30-4:30 pm

Email: [brownj@grinnell.edu](mailto:brownj@grinnell.edu)

Class webpage: <http://web.grinnell.edu/courses/bio/s05/bio373/>

### COURSE DESCRIPTION

This course examines the mechanisms of evolutionary change at both micro- and macroevolutionary scales. It will be run in workshop format, emphasizing the methods evolutionary biologists use to test and apply theories. Topics include the origin and maintenance of genetic variation, population structure and speciation, systematic methods, adaptation, molecular evolution, and macroevolution. Applications of evolutionary theory to conservation biology, medicine and the concept of human 'races' will be featured. We will also interact with three visiting scholars of evolution.

### COURSE REQUIREMENTS

**Meetings:** MWF 9-11am in Science 1021 and 1007.

Meetings will combine lectures and discussions with hands-on activities. The single required text is *Evolutionary Analysis* (3rd ed.) by Freeman and Herron. Additional readings for discussions are downloadable from the class webpage. A plan for the course (subject to revision) can be found attached to this syllabus -- in addition, I will hand out weekly assignment sheets each Friday, which will include the exact assignment and focus questions to help you get ready for each class. ***I expect you to have read the assignment carefully and thought about how you would answer the focus questions before you come to class.*** Writing out answers to these questions is a great way to get ready for class, and will help you to participate in discussions if you are generally reticent to do so.

On days on which a reading from the primary literature is assigned, you are required to submit 2 questions about the reading(s) at least 1 hour before class. Questions should be submitted via the Blackboard Discussion Board. *Please read others questions only after submitting your own.* I will use the submitted questions as a way to organize our discussion of each reading. A short (1-2 paragraph) answer that addresses one of the submitted questions will be due by the next class meeting. Answers should be thoughtful, well written and submitted by email. Fifteen percent of your grade will be based on my evaluation of your questions, your engagement in class discussions and activities, your written answers, and your satisfactory completion of other ungraded assignments (e.g., problem sets, computer labs).

Since this is a workshop course, there won't be a clear distinction between lecture and lab times. The better prepared you are for class, the easier it will be for you to see the connections between our lecture/discussions and hands-on work. If you look at the course plan, you may be able to discern 5 themes of hands-on activities:

- I. Quantitative analysis -- we'll review and introduce some fundamental quantitative techniques used by evolutionary biologists (and others) and use them extensively over the semester on data sets I will provide or you will generate.
- II. Modeling -- we'll use discrete and stochastic models to understand basic theories of microevolution, molecular evolution and systematics.

- III. 'Local ecotype' study –we will analyze variation among prairie plant species from different regions of the species' distribution. Our goal will be to test whether plants from different populations are phenotypically distinct when grown in common environments in the greenhouse. You will report on the results of your findings in the format of a scientific grant proposal, which will propose to determine whether these populations are locally-adapted ecotypes.
- IV. Phylogenetic methods -- We will learn the principles of phylogenetic analysis of multiple types of data using two related software packages (MacClade and PAUP). You'll use this experience to evaluate and present a paper from the literature (of your choice) in the form of an oral presentation.
- V. Ant population structure – After spring break, we'll concentrate on a multi-dimensional study of mound-building *Formica* ants that are common at CERA, Krumm preserve and other prairie restorations around Iowa. Different groups of students will examine genetic, morphological, behavioral and (possibly) chemical differences among colonies and sites. [As an alternative, you may choose to analyze genetic differences among your local ecotype plants.] You'll report on this project in the form of a scientific poster.

Much of the work done in this class will take place in groups, and I will ensure you work with different people during the course of the semester. If your group should have difficulties working together, please let me know.

**Quizzes:** I will test your understanding of concepts with 3 quizzes, which may vary in style from genetics problems to essay questions. The best strategy for studying for these quizzes is (1) to keep up with the assigned reading and homework, (2) be involved in class discussions, and (3) ask questions in class or during office hours when you are confused. Writing out answers to study questions given out on your weekly assignment sheets is a great way to make sure you understand the material -- I'll be happy to go over these with you, if you make an appointment or stop in during office hours. If you get less than 70% on a quiz, I'll ask you to retake it until you can pass this threshold; however, the maximum grade possible for a rewritten quiz will be 70%.

<b>Grades:</b>	Participation (incl. Questions, Answers, Homeworks)	15%
	Quizzes (3)	45%
	Papers	
	Local ecotype proposal	15%
	Systematics oral presentation	10%
	Ant project poster (group)	15%

Final letter grades:

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

I do not use a grading curve because I believe it discourages students from helping each other. However, I do consider the effect of single grades in dragging your score downwards. If you are worried about your performance in the class, please come talk to me. *Nothing is more satisfying to me than helping you understand these ideas; they should influence how you think about biology for the rest of your life!*