

**Ecological Genetics**  
**Integrative Biology 162**  
**Fall 2004**

**What is ecological genetics?**

"Nothing in biology makes sense except in the light of evolution."  
 Theodosius Dobzhansky (1970) *Genetics of the Evolutionary Process*

... "ecological genetics," [combines] field and laboratory work ... [and] deals with the adjustments and adaptations of wild populations to their environment. It is thus, essentially evolutionary in outlook. Indeed it supplies the means, and the only direct means, of investigating the actual process of evolution taking place at the present time."

E. B. Ford (1964) *Ecological Genetics*

In most biology curricula, ecology, evolution and genetics are taught as separate courses. However, the environment (ecology) and information transmission across generations (genetics) interact to produce evolutionary change. Natural selection results from ecological interactions of organisms with their biotic and abiotic environments. The ecological structure of populations (size, degree of fragmentation, etc.) determines the potential for genetic drift (non-adaptive genetic change in populations). Within population genetic variability for ecologically important phenotypic characters determines the speed and directionality of the response of populations to the selection resulting from ecological interactions. Thus, to understand the potential for (and constraints on) evolution in contemporary populations, one must consider both ecological and genetic issues. Further context is provided by placing analysis of contemporary populations into a phylogenetic context (either through phylogeographic analyses within species or through broader systematic analysis of sets of taxa).

Paraphrased from Sara Via (2002) <http://www.entmclasses.umd.edu/labs/via/ViaLab.html>

**What is IB 162?**

This course will unify ecology, genetics, and evolutionary biology. It will present contemporary approaches to studying evolution in natural populations, including quantitative and molecular methods for determining inheritance of ecologically important traits, measuring selection in natural systems, and using models to predict evolution in natural populations.

Lectures	TuTh 9:30 – 11 am 2326 Tolman	Discussions	W 3 - 4 2070 VL5B	Th 3 – 4 pm 107 GPB
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**What is required?**

Evaluation mechanisms	Mechanism	Percent
	Biweekly homework assignments (due at Tuesday lectures)	7
	Weekly quizzes (in discussion section)	12
	Class participation (lecture and discussion)	5
	Paper critiques (3)	18
	Midterm (in lecture)	20
	One 8-page grant proposal	18
	In-class final	20
Prerequisites:	Required: Bio 1A - 1B Recommended: Previous courses in genetics	

**Details?**

Homeworks and quizzes	Short and relevant to reading assignments or lecture topics. One quiz grade can be dropped.
Paper critiques	One-page critical evaluation of an assigned paper
Midterm	1-hour, on material covered up to 2 lectures prior to exam day
Grant proposal	Topic to be chosen with advice of GSI. This paper must use a literature review to test a hypothesis in ecological genetics. More info later.

All students will be required to do weekly readings, take weekly quizzes in discussion section, complete biweekly homework assignments (due on Tuesdays), take an in-class midterm and an in-class final, write an 8-page research proposal similar to a National Science Foundation Dissertation Improvement Grant proposal. The proposal must outline a research project that addresses a question of ecological genetic interest that could be carried out in a three year period. These proposals should consist of a literature review, a review of the importance of the problem, and an experimental (or theoretical) approach to address outstanding problems in the area. (More information will follow.)

**How to contact instructors?**

Instructor:	Ellen Simms	GSI:	Anne Swart
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phone	2-6992	phone	2-0591
office hrs	MTu: 11 - noon	office hrs	Tu 11-12, Wed 4-5

**Texts**

Required: Freeman, S. & J. C. Herron. 2004. *Evolutionary Analysis*, 3<sup>rd</sup> ed. Prentice Hall.

Recommended: Gotelli, N. J. 1995. *A Primer of Ecology*. Sinauer.

Additional readings may be assigned for particular lectures and discussion sections