In this course, we will focus on the genetic (either classical or molecular) underpinnings of ecologically-relevant (i.e., fitness-related) traits in natural populations. Ecological Genetics is a diffuse field that straddles ecology, evolution, and genetics, and increasingly incorporates molecular biology, bioinformatics, and genomics.

Our course has two goals: first, is to expose you to Ecological Genetics through content (research questions, approaches, and results) typical of this field. Second, is to build your skill set as a scientist. We will work on a theme each week (e.g., “genetic variation”), structuring our week to approach both content and skill-building through book readings, lectures, paper discussions, and various types of in-class work (graded or not), both in groups or individually.

Skills are focused on: 1) doing research science (for example, having Katy’s job at a major research university), 2) what will make biology graduate school easier for you (getting in and succeeding), and 3) what employers want from recent college graduates (of all ilks).

**Mondays: Lecture**

*Learning objectives:* Lectures and readings are my main avenue for communicating course content. Lecture and book readings are intended to give you an overview of contemporary research questions and approaches, as well as classic knowledge already acquired through research in this field (Conner and Hartl 2004). Lecture will complement and highlight, not duplicate, book readings.

**Wednesdays: Paper discussions**

*Learning objectives:* Reading, processing, and discussing the primary literature is intended to engage you in course content, develop critical evaluation skills, develop listening and communication skills, improve intellectual agility, and hopefully inspire you to learn more about this field (Soranno 2010). Critical reviews formalize the process of reading and studying the primary literature (3 per semester).

**Fridays: Lecture/Group work/In-class homework**

*Learning objectives:* Friday work hour is intended to teach you to focus and work efficiently towards solving ecological genetics problems and synthesizing course material. In other words – to make you into an ecological geneticist! We don’t take exams: we solve problems!
To this end, Fridays will incorporate mini proposals, mini papers, case studies, and/or problem sets – all forms of formative assessment – to get you thinking on your feet and allow me to gauge student learning as we progress through the course. Activities will be performed in groups, individually, or both. Friday activities will often be a surprise and will often be open-book/open-notes. You will be accountable for utilizing Monday and Wednesday’s material each Friday. Don’t worry: I will grade easy in the beginning, and you get to drop the worst 2 assignments. I hate assigning letter grades. This is a necessary evil, but not the main goal of my assessments.

BUT WHY?! My philosophy: If you are actually accountable for learning and using course content every time you are in class, then I am forcing you to engage with the material every time I see you. Otherwise our human instinct and past training tells us to passively listen until you need to study for an exam, at which point it’s too late. This is NOT how adults learn (Handelsman et al. 2007). In this course, I am actively trying to break the cycle of exam cramming followed by immediate purging. While this cycle might be more comfortable and easier for both of us, it does not actually contribute much to learning, has limited value for improving critical thinking, and moreover can never transform you into an ecological geneticist! Huzzah!

References:


Assignments:
Critical reviews: 20pts x 3 = 60pts
Discussion attendance: 20pts total
Friday assessments: 20pts x 14 weeks = 240pts (drop worst 2 weeks!)
TOTAL: 320pts

Late assignments: Late assignments will receive 10% deduction for each day late.
Grading scale: These are the guaranteed percentages of total points needed for each grade. I may curve everyone up at the end of the semester, if I believe that the grading scale is too severe. I also may apply two separate grading scales to undergrad/grad students, if need be.

A+ \geq 98%
A \geq 93%
A- \geq 90%
B+ \geq 88%
B \geq 83%
B- \geq 80%
C+ \geq 78%
C \geq 73%
C- \geq 70%
D+ \geq 68%
D \geq 63%
D- \geq 60%
Below 60 = F

This course will follow all policies in the Student Code:
http://www.admin.illinois.edu/policy/code/index.html

Attendance: Attendance at all class sessions is mandatory. You will be responsible for daily assignments and thus cannot afford to miss many class sessions. If you need to be excused for any reason, talk to me. You will need prior approval from me and/or documentation (doctor’s note, athletic department note, emergency dean approval) in order to make up any missed assignments or have them prorated. In the case of absences, excused or otherwise, it is your responsibility to 1) get caught up on content that you missed by getting notes from your peers, reading, etc., and 2) contact me about make up assignments and/or prorates, depending on the nature of the missed work and the length of illness within 2 weeks of missing the activity. Travel, weddings, jobs, other courses, etc. are not excused absences.

Academic integrity: See Article 104 (1-401 through 1-406) of the Student Code. This rule defines infractions of academic integrity, which include but are not limited to cheating, fabrication, and plagiarism. To learn more, including possible penalties, see the following website. You are responsible for being knowledgeable about what these infractions are and for following these guidelines. http://www.admin.illinois.edu/policy/code/article1_part4_1-401.html

Accommodations: If you require special accommodations, please tell me ASAP. All accommodations will follow the procedures as stated in Article 1-110 of the Student Code: http://www.admin.illinois.edu/policy/code/article1_part1_1-110.html
Course Schedule:
Unless otherwise stated, chapter readings in parentheses refer to the Connor & Hartl text, and course structure is Monday lecture, Wednesday paper discussion (PDFs will be posted on moodle), and Friday activities (these will vary week by week).

Week of January 14: Genetic variation 1

Monday: Pre-course feedback, introductions, lecture
Wednesday: No class: Katy is in DC at NSF!
Friday: Discussion: this syllabus and Soranno 2010

Readings: Chapter 1 & Chapter 2 (through pg. 22)

Week of January 21: Genetic variation 2

Monday: MLK day - no class!
Wednesday: Discussion: Lasky et al. 2012 and Tonsor 2012 (critical review; use Lasky)
Friday: finish lecture & activities

Readings: no chapter reading

Week of January 28: Population genetics 1: Hardy-weinberg and nonrandom mating

Readings: finish Chapter 2
Wed. Paper: Boys et al. 2005

Week of February 4: Population genetics 2: Mutation and drift

Readings: Chapter 3, through pg. 66
Wed. Paper: Lozier et al. 2011
Week of February 11: Population genetics 3: natural selection and intro to molecular evolution

Readings: finish Chapter 3
Wed. Paper: Tschirren et al. 2011

Week of February 18: Quantitative genetics 1: the additive model and variance partitioning

Readings: Chapter 4

Week of February 25: Quantitative genetics 2: G x E and genetic correlation

Readings: Chapter 5 through “artificial selection” (ends pg. 170)
Wed. Paper: Donohue & Schmitt 1999

Week of March 4: Quantitative genetics 3: mapping

Readings: finish Chapter 5
Wed. Paper: Colosimo et al. 2004

Week of March 11: Measuring selection 1: phenotypes

Readings: Chapter 6 (to middle of pg. 216)

Week of March 18: Spring break!

Week of March 25: Selection and the evolutionary response

Readings: Finish Chapter 6

Week of April 1: Ecological genomics: molecular tests of selection

Readings: Hohenlohe et al. 2010

Week of April 8: Coevolutionary genetics
Readings: Thompson 2005 Chapters 1 & 5
Wed. Paper: Newman et al. 2006 PNAS

**Week of April 15: Community genetics**

Readings: Hersch-Green et al. 2011

**Week of April 22: Applied ecological genetics**

Readings: Chapter 7
Wed. Paper: Hegreness et al. 2008 PNAS

**Week of April 29: TBA**

Monday: Student-designed assessment 1
Wednesday: Course reflection & student-designed assessment 2