Introduction:
Evolutionary ecology, as the name implies, lies at the interface of ecology and evolution. Evolutionary ecology generally considers how organisms have evolved and adapted to their abiotic and biotic environments and how current ecological processes interact with evolutionary history. The field requires an understanding of both evolutionary and ecological theory and incorporates an array of approaches and techniques depending on the question being pursued. Techniques include the observation and measurement natural populations, theoretical and mathematical modeling, and manipulative laboratory or field based experiments. Thus, a common goal in many evolutionary ecology studies is to understand the adaptive significance of variation among individuals, populations, and species in natural populations.

Overview:
This course is designed for graduate students and advanced undergraduates. Course format will be a combination of lectures and discussions. Each week, instructors will give background lectures (usually Tuesdays), and students will lead discussion sessions on the focal topic (usually Thursdays). Lectures and assigned readings provide a foundation in evolutionary ecology and a sampling of specific topics, while discussions will allow us to dive more deeply into specific topics. Because of the emphasis on class discussions, attendance is required. Students leading discussion should provide some background context for the paper being discussed (this may require additional readings), and all other students will be expected to participate in discussion with questions.

Students will be expected to have already taken foundation courses in Ecology, Evolution, Population/Quantitative Genetics, and Statistics. We want to strive for high-level discussions of advanced topics, not review basic concepts. Therefore, students without the appropriate prerequisites will be encouraged to drop the course.

Course Materials:
The textbooks for the course are:
Readings from the primary literature will be posted online.

Reading/Discussion:
Readings will be primarily based on a combination of classic and recent papers that reflect both historic and current progress in the field; most will be drawn from the primary literature. Critical
reading and discussion of papers is a fundamental component of graduate education and all students will be expected to participate and lead discussions.

Learning Objectives for Students:
Students will develop a deeper understanding on the theory and methods underlying why and how traits evolve in natural populations.

1) Students will be able to explain the historical background of major questions in evolutionary ecology as well as read, understand, and discuss current research.
2) Students will review the current literature on major topics at the interface of ecology and evolution and write a mini-review on the current state of knowledge on the top to shape their ideas into formal proposals, learn the skills of grant writing, and develop independent thinking.

Final project:
Students will identify an area of interest in Evolutionary Ecology and write a mini-review paper. The paper should be no longer than 8-10 pages plus references. Topics will need to be approved by the instructor. Below is a list of journals you will likely find most of your material:

· Evolution
· American Naturalist
· Ecology
· Trends in Ecology and Evolution
· Journal of Evolutionary Biology
· Evolutionary Ecology Research
· Evolutionary Ecology


Grading and Assessment:
Student performance will be evaluated based on in class participation and discussion, two exams and a final paper in the form of a mini-review. Each week papers from the primary literature will be assigned as reading and students will be expected to actively participate in discussion in class. To facilitate discussions, all students must bring some questions for discussion.

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Participation and discussion</td>
<td>20</td>
</tr>
<tr>
<td>Problem Set</td>
<td>10</td>
</tr>
<tr>
<td>Mid-term exam 1</td>
<td>20</td>
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<tr>
<td>Mid-term exam 2</td>
<td>20</td>
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<tr>
<td>Final Research Proposal</td>
<td>30</td>
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<tr>
<td>Total</td>
<td>100</td>
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## Lecture Schedule:

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>26 Aug</td>
<td>Introductions and Evolutionary Ecology: A Historical Perspective I (Cameron)</td>
</tr>
<tr>
<td>28 Aug</td>
<td>Evolutionary Ecology: A Historical Perspective II (Cameron) and Introduction to Problem Set I (John)</td>
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</tbody>
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**Required Background Readings**
Chapter 1 Ecological Genetics, Connor and Hartl

### Week 2

2 Sep Population Genetics I (Cameron)
4 Sep Population Genetics II (Cameron) - problem set 1 due

**Required Background Readings**
Chapters 2-3 Ecological Genetics, Connor and Hartl

### Week 3

9 Sept Mutation (John) - review problem set 1
11 Sept Quantitative and Ecological Genetics I (John) - introduce problem sets 2,3

**Required Background Readings**
Chapters 4,5 Ecological Genetics, Connor and Hartl

### Week 4

16 Sept Quantitative and Ecological Genetics II (John)
18 Sept Correlated Traits and Selection (John) - problem set 2 due

**Required Background Readings**
Chapters 6 Ecological Genetics, Connor and Hartl

**Optional Background Readings**

### Week 5

23 Sept Adaptation and Constraint (Cameron)
25 Sept Discuss Readings (Cameron and John): - review problem set 2, problem set 3 due

**Required Readings**
Kellermann et al. 2009. Fundamental evolutionary limits in ecological traits drive Drosophila species distributions. Science 325:

**Optional Background Readings**

### Week 6

30 Sept Trade-offs, Life Histories, and Fitness (Cameron)
2 Oct Discuss Readings (Cameron and John): review problem set 3

**Required Readings**
Optional Background Readings

**Week 7**  
7 Oct  Exam 1  
9 Oct Phenotypic Plasticity I: Ecological Genetics and Genotype x Environment (John)

**Required Readings**
Falconer, D. S. 1990. Selection in different environments: effects on environmental sensitivity (reaction norm) and on mean performance. Genetical Research, Cambridge 56:57-70

**Optional Background Readings**

**Week 8**  
14 Oct Phenotypic Plasticity II: Plasticity and Evolution (Cameron)  
16 Oct Discuss Readings (Cameron and John)

**Required Readings**

**Optional Background Readings**

**Week 9**  
21 Oct Local Adaptation (John)  
23 Oct Discuss Readings

1 PAGE PLAN/OUTLINE OF MINI-REVIEW DUE

**Required Readings**

**Optional Background Readings**
**Week 10**

28 Oct Speciation: Ecological Speciation (John)
30 Oct Discuss Readings (John and Cameron):

**Required Readings**

**Optional Background Readings**

**Week 11**

4 Nov Evolutionary Consequences of Species Interactions (Cameron)
6 Nov Discuss Readings (Cameron):

**Required Readings**

**Optional Background Readings**

**Week 12**

11 Nov Niche, specialization, and generalization (John)
13 Nov Exam 2 (John)

**Required Readings**

**Optional Background Readings**

**Week 13**

18 Nov Range Limits and Geographic Range Size (Cameron)
20 Nov Discuss Readings (Cameron):

**Required Readings**

**Optional Background Readings**
States, J.B. 1976. Local Adaptations in Chipmunk (Eutamias amoenus) Populations and Evolutionary Potential at Species’ Borders
Ecological Monographs 46; 221-256.


**Week 14**

25 & 27 Nov – No Class, Thanksgiving Week

**Week 15**

2 Dec Evolutionary conservation biology (Cameron)

4 Dec Discuss readings (Cameron and John):

**Required Readings**


**Optional Background Readings**


**Week 16**

9 Dec Final Discussion, Class Evaluation, and Final Paper Due