

IB 443 Evolutionary Ecology

3 credit hours

Professor Ken N. Paige

School of Integrative Biology

Department of Animal Biology

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Course Description: Emphasizes historical and current concepts in evolutionary ecology. Topics include constraints on selection, measuring selection, units of selection, life-history strategies including reproductive tradeoffs and strategies, senescence, phenotypic plasticity, the evolution of sex, sex ratio variation and sexual selection. Each week students will be required to read and discuss current and historic papers from the primary literature covering a wide variety of topics in evolutionary ecology. Students will also be required to research and orally present an evolutionary ecology topic of their choosing.

Prerequisite: IB 203, IB 302 or equivalent. Offered in alternate years.

Requirements that the Course Meets: Major in Integrative Biology (elective), Minor in Ecology and Conservation

Lectures: 9-9:50 MWF

Text (Recommended): Herron, Jon C. and Scott Freeman. 2014. *Evolutionary Analysis*. 5th Edition. Pearson Education, Inc.

Student Learning Outcomes: 1) Students will demonstrate broad-based knowledge of the fundamentals of Evolutionary Ecology, 2) Students will demonstrate skills in the observation and experimental study of organisms, using both field-based and laboratory-based approaches, 3) Students will demonstrate skills in identifying, accessing, comprehending and synthesizing scientific information, including interpretation of the primary scientific literature. This includes understanding key questions and hypotheses, interpreting results and conclusions, and evaluating quality through critique, 4) Students will demonstrate the ability to communicate original scientific work in the form of an oral presentation.

Emergencies

General Emergency Response Recommendations

[Run>Hide>Fight Video](#)

[Building Emergency Exits](#)

Policies

Attendance and Makeup Policy - Office of the Dean of Students

Academic Integrity

According to the Student Code, 'It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions.' Please know that it is my responsibility as an instructor to uphold the academic integrity policy of the University, which can be found here: http://studentcode.illinois.edu/article1_part4_1-401.html.

Disability Accomodations

To ensure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class are asked to see me as soon as possible.

Lectures

August 24 –	Course Organization
August 26 -	Evolutionary Ecology: A Historical Perspective
August 31 -	Some Useful Definitions – A Review
September 2 -	Some Useful Definitions - A Review
September 4 -	Discussion Reading - Travisano et al. 1995 - Roles of Adaptation, Chance and History in Evolution
September 7 -	Labor Day – No Class
September 9 -	Adaptationists Program/Constraints on Selection
September 11 -	Discussion Reading - Emlen et al. 2001 - Phylogenetic Constraint versus Ecological Optimization
September 14 -	Measuring Selection
September 16 -	Measuring Selection
September 18 -	Discussion Readings - Nur et al. 1988 - A ``Selfish'' B Chromosome that Enhances its Transmission by Eliminating the Paternal Genome; Hurst and Pomiankowski – The eyes have it; Wilkinson et al. 1998 - Male eye span in stalk-eyed flies indicates genetic quality by meiotic drive suppression
September 21 -	Units of Selection
September 23 -	Units of Selection
September 25 -	Discussion Readings - Lenski 1989 – Are some mutations directed?; Lolle et al. 2005 - Genome-wide non-mendelian inheritance of extra-genomic information in Arabidopsis ; Weigel and Jurgens 2005 – Hotheaded healer
September 28 -	Review for First Exam
September 30 -	Exam #1

- October 2 - Discussion Readings - Moran 2002 Microbial Minimalism: Minireview Genome Reduction in Bacterial Pathogens; Ochman and Moran 2001 Genes Lost and Genes Found: Evolution of Bacterial Pathogenesis and Symbiosis**
- October 5 - Units of Selection**
- October 7 - Phenotypic Plasticity**
- October 9 - Discussion Readings – Järemo et al. 1999. Plant Adaptations to Herbivory: Mutualistic versus Antagonistic Coevolution; Agrawal 2000. Overcompensation of plants in response to herbivory and the by-product benefits of mutualism**
- October 12 - Phenotypic Plasticity**
- October 14 - Life History Evolution – Senescence**
- October 16 - Discussion Readings – Bell 1984. Evolutionary and Nonevolutionary Theories of Senescence; Edney 1968. Evolution of senescence and specific longevity; Rose and Charlesworth 1980. A test of evolutionary theories of senescence.**
- October 19 - Life History Evolution - Senescence**
- October 21 - Life History Evolution - Reproductive Tradeoffs**
- October 23 - Discussion Readings – Trivers 1973. Natural Selection of Parental Ability to Vary the Sex Ratio of Offspring; Komdeur 1996. Facultative sex ratio bias in the offspring of Seychelles warblers**
- October 26 - Evolution of Sex - Why Bother?**
- October 28 - Review Exam #2**
- October 30 - Discussion Readings – Clarke et al. 2013. Detection and Learning of Floral Electric Fields by Bumblebees; Burkle et al. 2013. Plant-Pollinator Interactions over 120 Years: Loss of Species, Co-Occurrence, and Function**
- November 2 - Exam # 2**
- November 4 - Sexual Selection**
- November 6 - Discussion Readings – Grant and Grant 2006. Evolution of Character Displacement in Darwin's Finches; Schluter 1994. Experimental Evidence That Competition Promotes Divergence in Adaptive Radiation**
- November 9 - Student Presentations**
- November 11 - Student Presentations**
- November 13 - Discussion Readings – Pfennig and Servedio 2012. The role of transgenerational epigenetic inheritance in diversification and speciation; Vergeer et al. 2012. Evidence for an epigenetic role in inbreeding depression; Furey and Sethupathy 2013. Genetics Driving Epigenetics**
- November 16 - Student Presentations**
- November 18 - Student Presentations**
- November 20 - Discussion Readings - Linnen et al. 2009. On the Origin and Spread of an Adaptive Allele in Deer Mice; Forbes et al. 2009. Sequential Sympatric Speciation Across Trophic Levels**

November 21-29 -	Thanksgiving Break
November 30 -	Student Presentations
December 2 -	Student Presentations
December 4 -	Discussion Readings - Suzuki and Nijhout 2006 - Evolution of a Polyphenism by Genetic Accomodation; Rajakumar et al. 2012 - Evolution and Development
December 9 -	Review
Finals Dec 11-18	

Grades and Policies

Class Format

The class shall consist of two lectures per week followed by a Friday discussion of scientific literature - both past (classic) and present. Toward the latter part of the semester students will present their findings on relevant topics.

Participation - Discussions - Every Friday

Participation is essential to the discussion section. I will expect everyone to contribute and will "encourage" people who do not regularly contribute. More importantly, participation in discussion is essential to your own education both in terms of your understanding of concepts related to evolutionary ecology and in honing your verbal skills. I expect each student to come prepared with at least two questions about one or more of the papers each week to share with the class to help stimulate discussion and ensure everyone has read the assignment. Five of the ten points will be given for questions, five for discussion participation.

Student Presentations

Students will address a question in evolutionary ecology (I will present some questions for consideration or you can pose one yourselves). You will be expected to research the question in the literature and prepare a 15 minute powerpoint presentation for the class. Depending on class size I anticipate approximately 2 to 3 student presentations per class period (see schedule above).

Grading

Three lecture exams - 100 points each = 300 points
 Discussion - 14 days X 10 points (5 for discussion, 5 for questions) = 140 points
 Student Presentations = 1 presentation X 100 points = 100 points
 Total Points = 540