

**COURSE TITLE: ECOL-596W
PLANT EVOLUTIONARY GENETICS**

Fall 2013

Monday, Wednesday 2-2:50 PM BioSciences West 302*

*Schedule may change to accommodate students

Instructor

Dr. Michael Barker: BSW 321E; 621-2213; msbarker@email.arizona.edu.

Office hours: Wed 3-4PM

Website: <http://barkerlab.net/courses.html>

TENTATIVE SCHEDULE

Date Topic

8/26 Introduction

Evolution of plant populations

8/28 Migration

9/2 No class (Labor Day)

9/4 Migration

9/9 Mutation

9/11 Mutation

9/16 Adaptation

9/18 Effective Population Size

9/23 Adaptation

9/25 Epistasis & Pleiotropy

9/30 Dominance

10/2 Ploidy

10/7 Mating Systems

10/9 Mating Systems

10/14 Life History

10/16 Population Expansion

10/21 Population Bottlenecks

10/23 Domestication

Guest

Szovenyi

Wright

Readings

Ellstrand 1992

Morjan & Rieseberg 2004

Gaut et al. 1996

Ossowski et al. 2010

Siol et al. 2010

Gossman et al. 2010

Strasburg et al. 2010

Scarcelli et al. 2007 & Lovell et al.
2013

Mezmouk & Ross-Ibarra preprint

Szovenyi et al. 2013

Charlesworth & Charlesworth 1995

Slotte et al. 2013

Smith & Donohue 2008

Peischl et al. preprint

Brandvain et al. preprint

White & Doebley 1998 & Wang et
al. 1999

Species and speciation in plants:

10/28 Nature of Plant Species

10/30 Genetic Divergence of Plant Species

11/4 Hybridization & Introgression

11/6 Hybridization & Introgression

11/11 No class (Veteran's day)

11/13 Reproductive Isolation

11/18 Chromosomal Speciation

Rieseberg et al. 2006

Barker & Masalia, preprint

Barker et al., preprint and Arrigo &
Barker, preprint

Arnold 2004 & Castaic et al. 2008

Ramsey et al. 2003

Rieseberg 2001

11/20 Hybrid Speciation

Rieseberg et al. 2003 & Buerkle & Rieseberg 2007

11/25 Polyploid Speciation

Wood et al. 2009 & Mayrose et al. 2011

11/27 No class (Thanksgiving)

Evolution of plant genomes:

12/2 Duplication & Turnover

Barker et al. 2012

12/4 Chromosome Number Evolution

Barker et al., preprint

12/9 Repetitive Elements

Feschotte et al 2002

12/11 Organelle Genome Evolution

Adams et al. 2000 & Brandvain et al. 2007

Goals: This class has two major goals. The first goal is to gain a better understanding of how plants evolve. This is an important topic. Plants provide the food we eat, the oxygen we breathe, the homes that shelter us, the clothes we wear, and many of the drugs that protect us from disease. Plants mitigate pollution, lessen climate change, contribute to healthy watersheds, control erosion, provide habitat for animals, and add beauty to the places we live. Thus, there is considerable incentive for understanding their origin and diversification.

The second goal is to make the transition from textbook learning of evolutionary theory to using these first principles to interpret experimental and observational data of the natural world. All readings will be from refereed journal publications. To enhance discussion and provide context for each topic, we will employ a lecture/discussion format and focus on high-profile and well-written case studies of important topics in plant evolution.

Expectations:

1. Preparation. This seminar will be a series of short lectures and discussions. The success of discussions depends primarily on the selection and sequencing of the materials (for which I will be responsible) and on the preparation of the participants. To ensure the latter, and especially to allow time for integration and synthesis before class, each of you should provide (by 5 pm on the day preceding each class) a list of 3 to 6 salient points from each reading including the connections to prior readings. Alternatively, you may wish to provide a more lengthy critique of (a) one or more of the ideas the author(s) is/are attempting to convey; (b) the experimental design; or (c) aspects of the analysis and interpretation.

2. Final Exam. To fully integrate topics that have been discussed over the course of the semester, students will be given a final, open-note take-home exam. Students will be expected to cogently argue their positions on contemporary questions in plant evolutionary genetics with evidence drawn from the literature and theory.

Grades: Grades will be based on preparedness as evidenced by your twice-weekly summaries (30%), on your participation in class (20%), and on the final exam (50%). Summaries and class participation will be graded as acceptable or unacceptable. However, you will have the

opportunity to revise unacceptable summaries. There will be a 10% penalty for each day an assignment is late or awaiting revision.

Readings:
TBA

Some Relevant Books:

- Arnold ML. 1997. Natural Hybridization and Evolution. Oxford Univ. Press, Oxford.
- Arnold ML. 2006. Evolution through Genetic Exchange. Oxford Univ. Press, Oxford.
- Beebe T & Rowe G. 2004. An Introduction to Molecular Ecology. Oxford Univ. Press, Oxford.
- Briggs D & Walters SM. 1997. Plant Variation & Evolution, 3rd Edition. Cambridge Univ. Press, Cambridge.
- Clausen J. 1961. Stages in the Evolution of Plant Species. Harper Publishing Company, New York.
- Coyne JA & Orr HA. 2004. Speciation. Sinauer Associates, Sunderland, MA
- Dieckmann U, Doebeli M, Metz JAJ, Tautz D. 2004. Adaptive Speciation. Cambridge Univ. Press, Cambridge.
- Ellstrand NC. 2003. Dangerous Liaisons? When Cultivated Plants Mate with the Wild Relatives. John Hopkins Univ. Press, Baltimore.
- Falk DA & Holsinger KE. 1991. Genetics and Conservation of Rare Plants. Oxford Univ. Press, Oxford.
- Freeland JR. 2005. Molecular Ecology. John Wiley & Sons, Chichester, UK.
- Gavrilets S. 2004. Fitness Landscapes and the Origin of Species. Princeton.
- Grant V. 1971. Plant Speciation. Columbia Univ. Press, New York.
- Grant V. 1975. Genetics of Flowering Plants. Columbia Univ. Press, New York.
- Howard DJ & Berlocher SH, Eds. 1998. Endless Forms: Species and Speciation. Oxford Univ. Press, Oxford.
- Iwatsuki K, Raven PH & Bock WJ, Eds. 1986. Modern Aspects of Species. Univ. Tokyo.
- Judd JA et al., Eds. 2002. Plant Systematics: A Phylogenetic Approach. Sinauer Associates, Inc. Sunderland, MA.
- Lewis WH, Ed. 1980. Polyploidy: Biological Relevance. Plenum
- Levin DA. 2000. The Origin, Expansion, and Demise of Plant Species. Oxford Univ. Press, Oxford.
- Levin DA. 2002. The Role of Chromosomal Change in Plant Evolution. Oxford Univ. Press, Oxford.
- Lowe A, Harris S, Ashton P. 2004. Ecological Genetics: Design, Analysis, and Application. Blackwell Publishing, Oxford.

Lynch, M. 2007. *The Origins of Genome Architecture*. Sinauer Associates, Inc. Sunderland, MA.

Niklas KJ. 1997. *The Evolutionary Biology of Plants*. Univ. Chicago Press, Chicago.

Soltis DE et al. 2005. *Phylogeny and Evolution of Angiosperms*. Sinauer Associates, Inc. Sunderland, MA.

Stebbins GL. 1950. *Variation and Evolution in Plants*. Columbia Univ. Press, New York.

Willis KJ & McElwain JC. 2002. *The Evolution of Plants*. Oxford Univ. Press, Oxford.

Young A, Boshier D, Boyle T, Eds. 2000. *Forest Conservation Genetics*. CSIRO Publishing, Collingwood, Australia.

Policy On Expected Classroom Behavior

Enrollment in the course signifies that a student will participate to the best of his or her abilities in each class session. Except for those provided explicitly for classroom activities, no electronic communication devices should be used during the class session. Each student is expected to attend every class session; however, all holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion, and absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

Policy Against Plagiarism

<http://deanofstudents.arizona.edu/policiesandcodes>

Policy Against Threatening Behavior

<http://web.arizona.edu/~policy/threaten.shtml>

Academic Integrity

Integrity is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. This principle is furthered by the *Student Code of Conduct* and disciplinary procedures established by ABOR Policies 5-308 – 5-403, all provisions of which apply to all University of Arizona students. For further information, please see:

<http://deanofstudents.arizona.edu/policiesandcodes/codeofacademicintegrity>

Special Needs and Accommodations Statement

Students who need special accommodation or services should contact the SALT (Strategic Alternatives Learning Techniques), the Center for Learning Disabilities (SALT Center, Old Main, PO Box 210021, Tucson, AZ 85721-0021, (520) 621-1242, FAX (520) 621-9448, TTY (520) 626-6072), <http://www.salt.arizona.edu>, and/or the Disability Resources Center, 1540 E. 2nd Street, PO Box 210064, Tucson, AZ 85721-0064, (520) 621-3268, FAX (520) 621-9423, <http://drc.arizona.edu>. The appropriate office must document the need for accommodations.