

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 to learning from the scientific literature. We believe in total immersion, so there will be no textbook for this class. All readings will be from refereed journal publications. To ease the transition, we will employ a lecture/discussion format and focus on high-profile case studies and/or reviews of important topics in plant evolution. Our emphasis will be the evolution of land plants, of which approximately 300,000 species are extant today.

Expectations:

1. Preparation. This seminar will be a series of short lectures and discussions. To encourage preparation of the participants and to allow time for integration and synthesis before class, each of you should provide by **9 pm on Wednesday** a one-paragraph summary of each paper as well as a list of three or four salient points/questions for discussion. Such points could include: (a) aspects of the study you did not understand or were unclear; (b) the significance of the research to the field; (c) interesting methodology; (d) potential flaws (e.g. problems with the experimental design or aspects of the analysis and interpretation); (e) further directions; (f) connections to prior readings. Make sure you provide evidence to support your points and be sure to properly cite any additional material where appropriate. For each paper, these assignments should be no more than one page double-spaced. Summaries will be graded on a scale of 0 to 6 points. Please avoid all types of plagiarism!

2. Discussion. Each of you will be asked to lead one Thursday discussion. This should include a brief 5-10 minute presentation that describes the goals, experiments, results, and conclusions of the papers to be discussed. Where appropriate, please introduce the plant(s) that are the focus of the discussion. You may also wish to provide a short list of questions or topics for discussion. It is your responsibility to encourage discussion among your peers, but not to dominate the conversation.

3. Experiments. Propose two experiments that ought to be done to advance our understanding of evolution. Ideally these would be experiments that you would be tempted to carry out, but this is not a requirement. For each explain: (a) the question that motivates the proposed study; (b) why it is important; (c) the appropriate methodology; (e) predicted results; and f) the potential significance of the findings. Your proposal also should provide background for the study, as well as a list of one or more appropriate organisms and why you chose them. The research proposals should be approximately 5 pages in length double-spaced (12 point font, Times New Roman). The first proposal is due February 28, whereas the second proposal is due April 6. In addition, you will be asked to summarize one of these experiments for the class in the last few days of the semester.

4. Quizzes. To encourage review and synthesis of lecture material, there will be short bi-weekly quizzes on lecture material. Each quiz will take place on Thursday at the start of class, be 10 minutes in length and cover four lectures. The questions will be short answer or multiple choice and be 10 marks in total.

Grades:

Grades will be based on preparedness as demonstrated by your paper summaries/discussion points, on your participation in class, and on the proposed experiments. There will also be short bi-weekly quizzes on lecture material to encourage you to review and synthesize important information and concepts. There will be a 10% penalty for each day an assignment is late or awaiting revision.

Paper summaries/discussion points 1% each (25% total)

Quizzes 20%

Written research proposal 20% each (40% total)

Presentation of research proposal 5%

Discussion presentation 5%

Participation 5%

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.

Beebee 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.

Conner JC, Hartl DL. 2004. A Primer of Ecological Genetics. Sinauer Associates, Sunderland, MA

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.

- Hancock JF. 2012. Plant evolution and the origin of crop species. CABI Publishing, Cambridge, MA.
- Harder LD, Barrett SCH. Eds. 2006. Ecology and Evolution of Flowers (Oxford University Press, Oxford, UK.
- 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 of Angiosperms. Sinauer Associates, Inc. Sunderland, MA.
- Stebbins GL. 1950. Variation and Evolution in Plants. Columbia Univ. Press, New York.
- Stuessy TF, Ono M. 2007. Evolution and Speciation of Island plants. Cambridge University Press, Cambridge.
- Thompson JN. 2009. The Coevolutionary Process. University of Chicago Press, Chicago.
- 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.