

BIOL 451/551

Evolutionary Biology

Spring 2014

Lecture: 6 Weyandt **A01:** Tuesday/Thursday 3:30-4:20pm
Lab: 6, 120A Weyandt **A02:** Tuesday 11:15am-2:00pm; **A03:** Thursday 11:15am-2:00pm

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Lab: 18 Weyandt Lab telephone: 724-357-2484
Office hours: Tues/Thurs 9am-11am, Wed 9-10am

Textbook: Futuyma, D.J. 2013. **Evolution (3rd Ed.)**. Sinauer Associates, Inc.

Lab Textbook: Hall, B.G. 2011. **Phylogenetic Trees Made Easy: A How-To Manual (4th Ed.)**.
Sinauer Associates, Inc.

A comprehensive survey of evolution and evolutionary biology, including the history of evolutionary theory, natural selection, microevolutionary and macroevolutionary processes, and the phylogenetic history and classification of life on earth. In laboratory, students will focus on learning current methods in population-level and phylogenetic analysis, and presenting and leading peer discussions of important and current research in the field.

Attendance Policy: You are expected to attend every class, and to arrive ON TIME. Students that miss class typically have much lower grades than those who attend class *and* take notes.

Academic Integrity: I expect students to uphold a high standard for honesty and integrity in my classroom. Students caught cheating will be sanctioned as per University regulations, which can include failing the class, academic probation, or expulsion. Students caught committing PLAGIARISM on written work will, at minimum, automatically fail the assignment, and risk failing the class and being officially sanctioned, depending on the severity of the infraction.

Classroom Conduct: Please respect myself and your fellow students and **DO NOT** use your phone or text message in our classroom. Phones that ring in class may be answered by the professor in front of the class, and students who are observed texting will have their text messages read aloud to the class.

Email Conduct: If you email me or any other faculty member and want to be viewed as a serious and professional person, you should follow these simple guidelines:

1. Emails are NOT text messages, and (no matter how friendly they are) professors should not be communicated with as if they are a casual acquaintance. Format your email more like a letter, with a "Dear Dr. So-and-so" at the beginning... not "Hey" or simply writing a train-of-thought question or statement. There is *no such thing* as an informal email to a professor.

2. Include a Subject! Leaving the subject blank makes your email easy to accidentally overlook when a professor is scanning through the dozens of emails they deal with each day. Make yours stand out.

Grading: Exams will cover all material in the assigned readings, as well as material presented in lecture and lab. Make use of my office hours and plan study sessions with your peers to assist you with the material! If you need to miss an exam or lab due to an emergency or conflict, arrangements for an alternative exam or assignment **must** be made in advance or you will receive a grade of 0 (zero).

ASSIGNMENTS AND GRADING	
Exams (include both lecture and lab material)	300 points (3 exams x 100 points each)
Take-home exam questions (BIOL 581)	105 points (3 exams x 35 points each)
Research Paper (BIOL 451)	100 points
Research Paper (BIOL 581)	200 points
Research Paper Presentation	50 points
Lab Assignments	150 points
Discussion Presentation (BIOL 581 ONLY)	100 points
TOTAL AVAILABLE POINTS	600 (BIOL 451), 1005 (BIOL 581)

A = 90-100% (540+ / 900+ points); B = 80-89% (480+ / 800+ points); C = 70-79% (420+ / 700+ points); D = 60-69% (360+ / 600+ points); F = less than 60% (<360 / <600 points)

Research Paper Guidelines:

Students will prepare a research paper on a topic directly related to the materials covered in the course. Topics may include reviewing the evolutionary history of a particular group of organisms, the evolutionary biogeography of a region, a method or set of methods used to study evolution, or a biographical review of an important figure in evolution.

A 1 paragraph topic proposal, including at least 3 references from the scientific literature, will be due in class on Tuesday, 11 February 2014.

The final completed paper will be due in class on **Tuesday, 22 April 2014**. Late papers will be penalized 5 points PER DAY.

All pages double spaced, 12 pt font, Times New Roman; page total does NOT include references, figures, or other supplementary information

Undergraduates: 10 pages, 10+ references; Graduates: 15 pages, 20+ references

You will make a presentation of your paper during the final lab meetings of the semester. The presentation should be 5–7 minutes in length, allowing 3–5 minutes for questions.

LECTURE SCHEDULE		
Week of	Topics	Chapter (Futuyma)
21 Jan 2014	I. History of Evolutionary Thought	1
28 Jan 2014	I. Patterns of Evolution, History of Life on Earth	3, 4
4 Feb 2014	I. History of Life on Earth	4, 5
11 Feb 2014	I. Evolutionary Biogeography and the Origins of Biodiversity	6
18 Feb 2014	II. Origins of Biodiversity, Variation	7, 8
25 Feb 2014	II. Variation, Natural Selection	9,11
4 Mar 2014	II. Natural Selection, Adaptation	11,12
11 Mar 2014	II. Genetic Drift	10
18 Mar 2014	SPRING BREAK	
25 Mar 2014	III. Phenotypic Evolution	13
1 Apr 2014	III. Species and Speciation	17, 18
8 Apr 2014	III. Macroevolution	19, 22
15 Apr 2014	III. Life Histories, Sex, Conflict, and Cooperation	14, 15, 16
22 Apr 2014	IV. Evolution of Genes and Genomes	20
29 Apr 2014	IV. Evolution and Development; Evolution in Society	21, 23
6 May 2014	Final Meeting - <i>Thursday, 8 May, 12:30pm</i>	

LAB SCHEDULE		
Week of	Topics	
21 Jan 2014	NO LAB	
28 Jan 2014 (Rm 6)	Classification and the Tree of Life	Ch 2 (Futuyma), Ch 1, 2 (Hall)
4 Feb 2014 (Rm 6)	Classification and the Tree of Life - Caminucules	Ch 2 (Futuyma), Ch 1, 2 (Hall)
11 Feb 2014 (Rm 6)	Discussion: Evolution of Life on Earth Case Studies	Caminucules Due
18 Feb 2014 (Rm 120A)	Introduction to working with Sequence Data: Alignment and BLAST	Ch 3,4 (Hall)
25 Feb 2014 (Rm 120A)	Models of DNA Evolution / Distance-based Methods	Ch 5,6 (Hall) Project Proposal Due
4 Mar 2014 (Rm 6)	Student Presentations/Discussion: DNA "Barcoding"	Barcoding Protocol Due
11 Mar 2014 (Rm 120A)	Maximum Parsimony	Ch 8 (Hall)
18 Mar 2014	SPRING BREAK	
25 Mar 2014	NO LAB - Phylogenetic Project Work	
1 Apr 2014 (Rm 120A)	Maximum Likelihood and Bayesian Inference	Ch 9, 10 (Hall) NJ/MP estimates due
8 Apr 2014 (Rm 120A)	Population-level Analyses	Project Due
15 Apr 2014 (Rm 6)	Student Presentations/Discussion: Conservation Genetics Case Studies	
22 Apr 2014	Paper Presentations	Research Paper due
29 Apr 2014	Paper Presentations	

Suggested Readings

- Avise, J.C. 2000. *Phylogeography: The History and Formation of Species*. Harvard University Press.
- Avise, J.C. 2004. *Molecular Markers, Natural History, and Evolution*. Sinauer Associates, Inc.
- Barton, N.H., Briggs, D.E.G., Eisen, J.A., Goldstein, D.B., and Patel, N.H. 2007. *Evolution*. Cold Spring Harbor Laboratory Press.
- Baum, D. and Smith, S. 2012. *Tree Thinking: An Introduction to Phylogenetic Biology*. Roberts and Company Publishers.
- Carroll, S. B. 2006. *Endless Forms Most Beautiful: The New Science of Evo Devo*. W. W. Norton & Company.
- Cox, C.B. and Moore, P.D. 2010. *Biogeography: An Ecological and Evolutionary Approach (8th Ed.)*. Wiley-Blackwell.
- Felsenstein, J. 2004. *Inferring Phylogenies*. Sinauer Associates, Inc.
- Freeman, S. and Herron, J. 2007. *Evolutionary Analysis (4th Ed.)*. Pearson/Prentice Hall.
- Gould, S.J. 1990. *Wonderful Life: The Burgess Shale and the Nature of History*. W. W. Norton & Company.
- Gould, S.J. 2002. *The Structure of Evolutionary Theory*. The Belknap Press of Harvard University Press.
- Hennig, W. 1966. *Phylogenetic Systematics*. University of Illinois Press.
- Lemey, P., Salemi, M., and Vandamme, A. 2009. *The Phylogenetic Handbook: A Practical Approach to Phylogenetic Analysis and Hypothesis Testing*. Cambridge University Press.
- Losos, J.B. and Ricklefs, R.E. (eds.). 2010. *The Theory of Island Biogeography Revisited*. Princeton University Press.
- MacArthur, R.H. and Wilson, E.O. 1967. *The Theory of Island Biogeography*. Princeton University Press.
- Mayr, E. 1942. *Systematics and the Origin of Species*. Columbia University Press.
- Mayr, E. 1993. *One Long Argument: Charles Darwin and the Genesis of Modern Biological Thought*. Harvard University Press.
- Mayr, E. 2002. *What Evolution Is*. Basic Books.
- Nei, M. and Kumar, S. 2000. *Molecular Evolution and Phylogenetics*. Oxford University Press.
- Ridley, M. 2004. *Evolution (3rd Ed.)*. Wiley-Blackwell.
- Wiley, E.O. and Lieberman, B.S. 2011. *Phylogenetics: Theory and Practice of Phylogenetic Systematics (2nd Ed.)*. Wiley-Blackwell.
- Wiley, E.O., Siegel-Causey, D., Brooks, D.R., and Funk, V.A. 1991. *The Compleat Cladist: A Primer of Phylogenetic Procedures*. University of Kansas Museum Of Natural History Special Publication No. 19.