

Integrative Biology 200B "PRINCIPLES OF PHYLOGENETICS: ECOLOGY AND EVOLUTION"

Syllabus • Spring 2011

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Class meeting time: Tu-Th, 12:30 - 3:30 pm in 3083 VLSB. This year lab exercises will be done on personal computers -- you need to have access to one to bring to class, preferably a laptop!

Our class web page is: <http://ib.berkeley.edu/courses/ib200b/> -- please check this often as it will have class announcements and answers to questions about the course material.

Tentative Schedule of Topics:

- Jan. 18: Introduction to aims of course / Phylogenetic reconstruction in a nutshell: homology & characters (BDM)
LAB: Get acquainted roundtable (all)
- Jan. 20: Phylogenetic reconstruction in a nutshell: trees (BDM)
LAB: tour of systematics collections & resources in VLSB
- Jan. 25: What can we do with trees once we have them? 1. Classification classical and modern (DRL)
LAB: Introduction to Statistical Thinking (all)
- Jan. 27: Qualitative character evolution within a cladogram (discrete states; ancestral state reconstructions; single characters - BDM)
LAB: Introduction to Mesquite; Discrete character reconstruction (Matzke)
- Feb. 1: Qualitative character evolution (comparing two or more characters - BDM)
LAB: Phylogenetic Conservatism and Correlation of Discrete Characters (Mesquite - Matzke)
- Feb. 3: Quantitative character evolution within a cladogram (intro; ancestral trait reconstruction; phylogenetic conservatism - BDM)
LAB: Introduction to R (Matzke)
- Feb. 8: Evolution and development - heterochrony (DRL)
LAB: Intro to R continued: Phylogenies; Continuous characters (Matzke)
- Feb. 10: Independent contrasts and trait correlations (Ginger Jui)
LAB: independent contrasts (R) (Matzke)
- Feb. 15: Morphometrics (DRL)
LAB: morphometrics applications (Matzke)
- Feb. 17: Fossil data in phylogenetics (DRL)
LAB: **PROJECT TOPIC DUE: discuss your potential project in class**
- Feb. 22: Tempo in macroevolution (DRL)
LAB: testing molecular clock, r8s, BEAST (Matzke)
- Feb. 24: Dating in the 21st Century: putting dates on nodes, characters, and events (DRL)
LAB: discussion: the use of fossil data in phylogenetic reconstruction (all)
- March 1: Molecular evolution (BDM)
LAB: analysis of molecular evolution; substitution models, Modeltest, etc (Matzke)
- March 3: Gene family evolution; comparative genomics (Matzke)
LAB: tools for comparative genomics; BLAST, etc. (Matzke)
- March 8: Evolution and Development (DRL)
LAB: tools for evo-devo (Matzke)
- March 10: Phylogenetics and adaptation (BDM)
LAB: discussion of adaptation (all)

- March 15: Comparing sister clades within a cladogram: the shape of evolution (DRL)
LAB: generating random trees; testing cladogram imbalance (Matzke)
- March 17: Adaptive radiations (BDM)
LAB: lineages through time; diversification analyses (Matzke)

March 21 - 25:	SPRING BREAK
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- March 29: Speciation and related issues: species revisited (BDM)
LAB: **QUIZ 1**
- March 31: Reticulation and phylogenetics; "phylogeography" and population biology (BDM)
LAB: discussion of species (all) (**your project data set should be complete**)
- April 5: Phylogenetics and conservation biology (BDM)
LAB: coalescence theory; applications in population genetics and phylogeography (Matzke)
- April 7: Modes in macroevolution - patterns of diversification and extinction (DRL)
LAB: discussion on levels of selection (all)
- April 12: Comparing cladograms; supertrees; coevolution; symbiosis (BDM)
LAB: consensus methods; Brooks parsimony (Matzke)
- April 14: Biogeography I -- basic principles; ecological vs. historical approaches; vicariance biogeography (DRL)
LAB: Biogeographic software; DIVA, Lagrange (Matzke)
- April 19: Biogeography II -- New tools, databases, and research possibilities (Matzke)
LAB: **discuss progress on projects in class (hand in outline of project April 18th, details TBA)**
- April 21: Interactions among clades in macroevolution (DRL)
LAB: discussion of application papers (students to bring papers from their groups)
- April 26: Phylogenies and Community Ecology; Assembly of Regional Biota (Ginger Jui)
LAB: phylocom, picante (Matzke)
- April 28: Glimpses of the future - comparative and functional genomics; integrating genetics, physiology, ecology and evolution (all)
LAB: **QUIZ 2**

May 2 - 6:	Reading/Review Week -- work on projects with help from instructors
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May 9-13:	FINALS WEEK -- student minisymposium -- projects due (dates to be determined)
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Requirements & Grading:

(¹/₃) **Participation.** Do the reading, come to each class and lab, and participate in discussions. A few homework assignments will also be given.

(¹/₃) **Quizzes.** Two equally-weighted, one-hour quizzes will be given, that emphasize problem solving and conceptual understanding.

(¹/₃) **Project.** This will be a substantive, comparative analysis of data from a group of the student's choice (with approval of the instructors; we encourage the study of thesis or other study groups). Based on phylogenetic trees (whether self-generated or from the literature), the project should apply all appropriate comparative methods to evaluate several types of comparative questions. There should also be a rigorous critique of previous comparative literature on the organismal group of choice. A written report will be turned in during finals week, in the form of a professional journal publication, that is, with an introduction (containing the literature review and critique), materials and methods section, results (using summary figures -- no raw data), and a discussion (being sure to compare results from the different methodologies applied, and to reach some biological conclusions). We will schedule a minisymposium at the end of the term where students can give a short presentation of their results.