Professors:
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Week 1:

Jan. 20. Introduction - contemporary issues in phylogenetic systematics - what is at stake? (KWW)
LAB: discussion: student interests; get acquainted roundtable; Tour of systematics collections, labs, and resources in VLSB

Jan. 22. Introduction - contemporary issues in comparative methods (DDA)

Week 2:

Jan. 25. Introduction - history & philosophy of phylogenetics; the Hennig Principle: homology; synapomorphy; rooting; integrating fossils (BDM)

Jan. 27. Morphological data I: ontogeny & structure of plants vs. animals; character analysis; what is a data matrix? (BDM)
LAB: Discussion about homology; Introduction to Nexus and Newick files; Introduction to FigTree and Mesquite

Jan. 29. Morphological data II: Character coding [primary homology, polarity, additivity, etc.]; (KWW)

Week 3:

Feb. 1. Molecular data I: General introduction; types of molecular data (DNA hybridization; allozymes; restriction sites, DNA sequences, ESTs; comparative genomics) (BDM)

Feb. 3. Molecular data II: Sequence alignment (KWW)
LAB: **PROJECT TOPIC DUE -- discuss in class**; introduction to GENBANK and FASTA files; BLAST; sequence analysis and alignment (Clustal, Muscle, AliView)

Feb. 5. Phylogenetic trees I: reconstruction; models, algorithms & assumptions (BDM)

Week 4:

Feb. 8. Phylogenetic trees II: Phenetics; distance-based algorithms (KWW)

Feb. 10. Phylogenetic trees III: Parsimony; Measures of support and robustness (KWW)
LAB: Distance and parsimony inference using PAUP; UPGMA, neighbor-joining, bootstrap, jackknife, and Bremer support

Feb. 12. Phylogenetic trees IV: Maximum likelihood; molecular evolution and phylogenetics (KWW)

Week 5:

Feb. 17. Phylogenetic trees V: Bayesian methods and Markov Chain Monte Carlo (WF)
LAB: Maximum likelihood inference using PAUP and jModelTest; RAxML and CIPRES supercomputer web interface

Feb. 19. Phylogenetic trees VI: Dating in the 21st century: clocks, & calibrations; proper use of fossils (KWW)

Week 6:

Feb. 22. Phylogenetic trees VII: Tree-to-tree comparisons; consensus methods; supertrees (KWW)

Feb. 24. Introduction to statistical thinking in phylogenetics (DDA)
LAB: Bayesian inference using MrBayes and BEAST; Tracer; molecular clocks and fossil calibrations

Feb. 26. Qualitative character evolution within a cladogram I: discrete states; ancestral state reconstructions (DDA)

Week 7:

Feb. 29. Qualitative character evolution within a cladogram II: comparing two or more characters (DDA)

Mar. 2. Quantitative character evolution within a cladogram I: intro; ancestral trait reconstruction; phylogenetic conservatism (DDA)
LAB: Intro to R; Basic Phylogenetic Functions in R

Mar. 4. Quantitative character evolution within a cladogram II: independent contrasts and trait correlations (DDA)

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Week 8:
Mar. 7. Phylogenetics and adaptation (DDA)
Mar. 9. Classification I -- introduction to phylogenetic classifications; monophyly, information content (KWW)
LAB: Intro to R continued; continuous characters; ancestral state reconstruction; independent contrasts
Mar. 11. Classification II -- phylogenetic taxonomy including incorporation of fossils; Phylocode (BDM)

Week 9:
Mar. 14. Classification III -- species concepts; speciation (BDM)
Mar. 16. Classification IV -- DNA barcoding and DNA taxonomy (KWW)
LAB: **discuss progress on projects;** Online systematic databases: nomenclature, geography, phylogeny, specimens
Mar. 18. Classification V -- nomenclature; Zoological & Botanical Codes; practical systematics, monography (KWW); **QUIZ 1** handed out (due that evening)

Mar. 21-25. SPRING BREAK

Week 10:
Mar. 28. Evolution and development - heterochrony (BDM)
Apr. 30. Molecular evolution (BDM)
LAB: Introduction to RevBayes: phylogenetic analysis using graphical models and Markov Chain Monte Carlo
Apr. 1. Gene family evolution; comparative genomics; evo-devo (BDM)

Week 11:
Apr. 4. Phylogenetic trees VIII: Below the "species level;" phylogeography; dealing with reticulation (BDM)
Apr. 6. Tempo and mode in macroevolution; patterns of diversification and extinction (BDM)
LAB: Coalescence theory: gene tree-species tree reconstruction using RevBayes and the multispecies coalescent
Apr. 8. Phylogenetics and conservation biology (BDM)

Week 12:
Apr. 11. Comparing sister clades within a cladogram: the shape of evolution (DDA)
Apr. 13. Adaptive radiations (DDA)
LAB: **discuss progress on projects in class; present initial analysis of project dataset**; Birth-death models; joint character evolution and diversification analyses using BiSSE; detecting diversification rate shifts using BAMM
Apr. 15. Phylogenies and Community Ecology I (DDA)

Week 13:
Apr. 18. Phylogenies and Community Ecology II (DDA)
Apr. 20. Biogeography I: basic principles; ecological vs. historical approaches (KWW)
LAB: Community and spatial phylogenetics: picante, Phylocom; introduction to BIODIVERSE, phylogenetic beta-diversity, mapping
Apr. 22. Biogeography II: vicariance biogeography; detecting dispersal (KWW)

Week 14:
Apr. 25. Biogeography III: phylogenetics and range modeling; biome recognition and other spatial issues (BDM)
Apr. 27. Comparing cladograms; cospeciation methods (DDA)
LAB: **discuss progress on projects in class**; Probabilistic biogeographic models using BioGeoBEARS and RevBayes
Apr. 29. Coevolution; symbiosis (DDA); **QUIZ 2** handed out (due that evening)

Weeks 15 & 16:
May 6. S**tudent minisymposium**
May 11. **Final papers due**

# of lectures (40 total):
DDA 13
KWW 13
BDM 13
WF 1

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