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Class meeting time: Tu-Th, 12:30 - 3:30 pm; lecture is in room 3083 VLSB. Labs are sometimes in either the computer teaching room in front of library (Macs), or room 3056 near the IB office (PCs). Lab time can vary also, but will be announced in lecture. Additional drop-in lab sessions will be set up for students to do homework and/or projects.

Tentative schedule:

- Jan. 22: Introduction – contemporary issues in systematic biology—what is at stake? (DRL, BDM, KWW, & SAS)
LAB: Discussion: student interests
- Jan. 24: What is Systematic Biology? History & Philosophy (BDM)
LAB: Tour of systematics collections, labs, and resources
- Jan. 29: The Hennig Principle: Homology; synapomorphy; rooting issues (BDM)
LAB: A simple parsimony algorithm by hand (BDM)
- Jan. 31: Character analysis – what is a data matrix? (BDM)
LAB: Matrices MacClade and Mesquite
- Feb. 5: Morphological data I – the importance of incorporating fossils into phylogenetics (DRL)
LAB: Introduction to PHYLIP
- Feb. 7: Morphological data II – ontogeny & structure of animals (DRL)
LAB: **PROJECT TOPIC DUE**
- Feb. 12: Morphological data III – character coding: primary homology, polarity, additivity, etc. (KWW)
LAB: GENBANK; sequence analysis
- Feb. 14: Morphological data IV – ontogeny & structure of plants (BDM)
LAB: Introduction to WinClada, Nona, TNT
- Feb. 19: Molecular data I – general introduction; types of molecular data (immunological distance; DNA hybridization; allozymes; restriction sites, DNA sequences; genomics) (BDM)
LAB: Introduction to POY, Clustal
- Feb. 21: Molecular data II – sequence alignment (KWW)
LAB: Alignment Assignment
- Feb. 26: DNA bar coding and DNA taxonomy (KWW)
LAB: Introduction to PAUP
- Feb. 28: Classification I – nomenclature; Zoological & Botanical Codes; practical systematics, monography (KWW)
LAB: **Discuss progress on projects in class**
- March 4: Classification II – introduction to phylogenetic classifications (monophyly, information content) (DRL)
LAB: Advanced PAUP
- March 6: Classification III – phylogenetic taxonomy; Phylocode (DRL)
LAB: Discussion of phylogenetic taxonomy
- March 11: Classification IV – species concepts (BDM)
LAB: **Matrix day: analyze your own matrix**
- March 13: Classification VI – integrating fossils into classifications (DRL)
LAB: Discussion of molecular application papers (**students to bring papers from their groups**)
- March 18: Phylogenetic trees I – reconstruction; models, algorithms & assumptions (BDM)
LAB: Discussion of molecular application papers (**students to bring papers from their groups**)
- March 20: Phylogenetic trees II – Parsimony (KWW)
LAB: **QUIZ 1** (covers through March 13th)

(over)

March 24 - 28: SPRING BREAK

- April 1: Phylogenetic trees II – phenetics; distance-based algorithms (DRL)
LAB: UPGMA and neighbor-joining using PAUP
- April 3: Phylogenetic trees IV – Maximum likelihood; molecular evolution and phylogenetics (KWW)
LAB: Maximum likelihood applications using PAUP and Modeltest
- April 8: Phylogenetic trees V – Bayesian methods (Jimmy M. or John H.?)
LAB: Mr Bayes
- April 10: Phylogenetic trees VI – measures of support; methods of testing robustness and threshold values (KWW)
LAB: Bootstrap, jackknife, and Bremer support
- April 15: Phylogenetic trees VII – tree-to-tree comparisons; consensus methods (KWW)
LAB: Tree comparisons
- April 17: Phylogenetic trees VIII – below the "species level;" phylogeography; dealing with reticulation (BDM)
LAB: **Discuss progress on projects in class**
- April 22: Morphometrics (DRL)
LAB: Morphometrics
- April 24: Dating in the 21st century: estimating divergence times, clocks & calibrations (DRL)
LAB: R8S
- April 29: Historical Biogeography (KWW)
LAB: Biogeographic software; COMPONENT, DIVA
- May 1: Introduction to macroevolution (diversification, extinction, coevolution) (DRL)
LAB: Discussion on the use of phylogenetic trees in macroevolution
- May 6: Introduction to comparative methods for evolution, ecology & behavior (BDM)
LAB: Advanced MacClade & Mesquite
- May 8: Conclusion, summary and discussion: the central role of phylogenetic systematics in comparative biology – future directions? (DRL, BDM, KWW, & SAS)
LAB: **QUIZ 2** (covers March 18th through May 8th)

<p>May 12-22: FINALS WEEK – Student minisymposium (date to be chosen later) – Projects due (May 21st @ 5:00pm)</p>
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Requirements & Grading:

(¹/₃) **Participation.** Do the reading, come to each class and lab, and participate in discussions. Several homework assignments will also be given. **Phylogenetics Discussion Group:** attendance is suggested for this student-run group as well – it includes other faculty and students but complements our course well.

(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 an analysis of the interrelationships (in all senses) among a set of unit taxa. Students select a study group (with approval of the instructors) **by Feb. 7** containing about 6-10 unit taxa. You must be able to obtain actual samples of each unit taxon, which you will study to discover and describe characters, incorporating pertinent literature, databases, etc. This will be followed by an analysis of interrelationships using all major available data and methodologies. A written report will be turned in during finals week, in the form of a professional journal publication, that is, with an introduction and literature review, materials and methods section, results, and a discussion (being sure to compare results from the different methodologies applied, and to reach some ecological/biogeographic/evolutionary conclusions if possible). We will schedule a minisymposium at the end of the term where students can give a short presentation of their results. **Begin this project immediately: “things always take longer than you think, even when you take into account Hofstaeder’s Law”** (Hofstaeder’s Law—from his Göedel, Escher, Bach).