

# MOLECULAR PHYLOGENY & MICROBIAL DIVERSITY

**BIOLOGY 436/545D**

**FALL 2000**

**Instructor:** Craig L. Moyer  
**Email:** cmoyer@hydro.biol.wvu.edu  
**Office Hours:** M, W, F 3-4pm; and by Appt., BI 409

**Class Meetings:** Lecture: TR, 12:30-2:00pm, BI 415  
Lab: TR, 3:00-5:00pm AH 5 & BI 461

## **Mandatory Text:**

Molecular Evolution: A Phylogenetic Approach, Roderic Page & Edward Holmes, 1998  
ISBN: 0-86542-889-1

Note: Updated information & reading assignments to be posted on the class web site:  
<http://fire.biol.wvu.edu/cmoyer/cmoyer.courses.html>

## **Course Goals:**

- Historical Perspective of Molecular Phylogeny
- Microbial Diversity's Revolutionary Impact on the Hierarchy of Life
- Molecular Evolution of Biological Macromolecules
- Phylogenetic Algorithms as Models of Evolutionary Processes
- Reconstruction of Evolutionary History from Genes and thereby inferring Organisms
- Origins of Life and the Implications on Prokaryotic Evolution

## **Tentative Class Schedule:**

<b>September</b>	28	Overview and Organizational	Week 1
<b>October</b>	3	A Brief History of Phylogeny & Molecular Methods	Week 2
	5	Recent Revolution in Microbial Diversity	Week 2
	10	Lessons from the BIG TREE of Life	Week 3
	12	Trees: Nomenclature and Informational Content	Week 3
	17	More on Trees: Cladistics & Phenetics	Week 4
	19	Genes: Organization, Function & Evolution	Week 4
	24	Measuring Genetic Change	Week 5
	26	Inferring Molecular Phylogeny	Week 5
	31	Algorithms as Models of Evolution	Week 6

<b>November</b>	2	Algorithms as Models of Evolution II Topic proposals DUE	Week 6
	7	Models of Molecular Evolution: Neutral Theory	Week 7
	9	Applications of Molecular Phylogenetics	Week 7
	14	Molecular Perspectives on the Origins of Life Review of Topics: Term Paper Outlines DUE	Week 8
	16	Functional Genomics & Bioinformatics	Week 8
	21	Group Discussions of Molecular Phylogenetic Topics I	Week 9
	28	Group Discussions of Molecular Phylogenetic Topics II	Week 10
	30	Group Discussions of Molecular Phylogenetic Topics III	Week 10
<b>December</b>	5	Group Discussions of Molecular Phylogenetic Topics IV P/U Take Home Final	Week 11
	7	Course Summary, Review & Final Thoughts	Week 11

**NOTE:** Take Home Final (**Due Monday, December 11<sup>th</sup> by 5pm**)  
Term paper/projects (**Due Friday, December 15<sup>th</sup> by 5pm**)

### **Course Description:**

This course will explore the effects of the recent revolutionary discoveries in microbial diversity, the reconstruction of evolutionary history at both molecular and organismal levels, and the implications of the origins of life on prokaryotic evolution. The course will emphasize applications of phylogenetic theories and methods to the understanding and “modeling” of the evolutionary progression of life. Multiple phylogenetic reconstruction algorithms will be closely examined and scrutinized.

### **Course Evaluation and Grading:**

Class participation, including participation in discussion groups (**10%**); Midterm exam (**20%**); Final Take-Home Exam (**25%**); Laboratory Notebook & Final Trees (**25%**); Term paper, 8 – 10 pages, double spaced, including standardized references (**20%**).

**Graduate Students** will each be expected to lead a group discussion and will be given additional laboratory assignments (i.e., additional sequence data for analysis). **Every student** will be expected to undertake a project that will be included in a group discussion **AND** producing a term paper on a related topic of interest agreed upon by student and instructor ahead of time. The discussion groups will consist of 2-3 assigned papers from the primary literature a week ahead of time for the entire class to read and then discussing the applicability of those papers to molecular phylogeny during the designated class period.

### **Tentative Laboratory Schedule:**

<b>September</b>	28	Overview and Organizational	Week 1
<b>October</b>	3	Molecular Biology Overview & Strategy	Week 2
	5	Building Contig Files using GeneTool	Week 2
	10	Building Contig Files using GeneTool (cont.)	Week 3
	12	Sequence Similarity Measures using the RDP	Week 3
	17	RDP & NCBI Workshop: Similarity Screening	Week 4
	19	Chimera Checking & Secondary Structure Analysis	Week 4
	24	Choosing of Taxa to Define Your Taxon with RDP	Week 5
	26	Sequence Alignments: File Formats	Week 5
	31	Sequence Alignments: File Formats II	Week 6
<b>November</b>	2	Sequence Alignments: File Formats III	Week 6
	7	<b>Midterm Exam – During Lab Class Period</b>	Week 7
	9	Application of Algorithms: Character & Distance Data	Week 7
	14	Generating Phylogenetic Trees I	Week 8
	16	Generating Phylogenetic Trees II	Week 8
	21	Bootstrapping Analyses	Week 9
	28	Annotating Final Trees	Week 10
	30	Interpreting Data & Final Tree Analysis	Week 10
		No Formal Labs Dead Week	