MOLECULAR PHYLOGENY (& MICROBIAL DIVERSITY)

BIOLOGY 436/545D   **FALL 2002**

Instructor: Craig L. Moyer
Email: cmoyer@hydro.biol.wwu.edu
Office Hours: **T, R** 3-5pm; and by Appt., BI 409

Class Meetings: Lecture: WF, 1:00-2:30pm, BI 415
                         Lab: WF, 3:00-5:00pm BI 155 or BI 461 on occasion

Mandatory Texts:
Molecular Evolution and Phylogenetics, M. Nei & S. Kumar, 2000
ISBN: 0-19-513585-7
Phylogenetic Trees Made Easy, B. Hall, 2001
ISBN: 0-87893-311-5
Note: Updated information & reading assignments to be posted on the class web site:
                         http://fire.biol.wwu.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:

September	25	Overview and Organizational	Week 1
	27	A Brief History of Phylogeny	Week 1
October	2	Overview of Molecular Methods	Week 2
	4	Recent Revolution in Microbial Diversity	Week 2
	9	Lessons from the BIG TREE of Life	Week 3
	11	Trees: Nomenclature and Informational Content	Week 3
	16	More on Trees: Cladistics & Phenetics	Week 4
	18	Genes: Organization, Function & Evolution	Week 4
	23	Measuring Genetic Change	Week 5
	25	Inferring Molecular Phylogeny	Week 5

	30	Algorithms as Models of Evolution	Week 6
November	1	***Midterm Exam***	Week 6
	6	Models of Molecular Evolution: Neutral Theory ***Topic proposals DUE	Week 7
	8	Applications of Molecular Phylogenetics	Week 7
	13	Molecular Perspectives on the Origins of Life ***Review of Topics: Term Paper Outlines DUE	Week 8
	15	Functional Genomics & Bioinformatics	Week 8
	20	Group Discussions of Molecular Phylogenetic Topics I	Week 9
	22	Group Discussions of Molecular Phylogenetic Topics II ***P/U Take Home Final	Week 9
December	4	Group Discussions of Molecular Phylogenetic Topics III	Week 11
	6	Course Summary, Review & Final Thoughts	Week 11

NOTE: Take Home Final **(Due Monday, December 6th by 5pm)**
Term paper/projects **(Due Friday, December 9th 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 multiple group discussions 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:

September	27	Overview and Organizational Orientation	Week 1
October	2	Molecular Biology Overview & Sequencing Strategy	Week 2
	4	Building Contig Files using GeneTool	Week 2
	9	Building Contig Files using GeneTool (cont.)	Week 3
	11	Sequence Similarity Measures using the RDP	Week 3
	16	RDP & NCBI Workshop: Similarity Screening	Week 4
	18	Chimera Checking & Secondary Structure Analysis	Week 4
	23	Choosing of Taxa to Define Your Taxon with RDP	Week 5
	25	Sequence Alignments: File Formats	Week 5
	30	Sequence Alignments: File Formats II	Week 6
November	1	Application of Algorithms: Character & Distance Data I	Week 6
	6	Application of Algorithms: Character & Distance Data II	Week 7
	8	Generating Phylogenetic Trees I	Week 7
	13	Generating Phylogenetic Trees II	Week 8
	15	Bootstrapping Analyses & Measures of Confidence	Week 8
	20	Annotating Final Trees	Week 9
	22	Interpreting Data & Final Tree Analysis	Week 9
December	4/6	No Formal Labs Scheduled Dead Week ***Catch-Up & Finish-Up Projects If Needed	Week 11