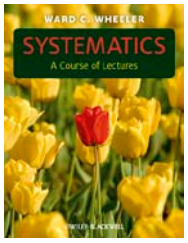




**Books to be used in our course. Brooks and McLennan an Ward Wheeler.**

# BIOSYSTEMATICS AND NOMENCLATURE

University of Nebraska - Lincoln
Lecture Schedule, Spring Semester 2014
Professor - - - Scott Lyell Gardner, Ph.D.

E-mail: slg@unl.edu, Tel: 402-472-3334 Cell: 402-540-9310
Office: W-529 Nebraska Hall
Office Hours: Monday 9:30 – 11:00 or by appointment.
[Note that this schedule may change depending on the speed with which we cover material in class]

--In addition to the Nature of Diversity and Systematics we will have assigned readings.

| Week - -date - | | Topics | Reading Assignment From: Brooks and McLennan Chapter | Pages |
|---|---|---|---|---|
| 1 | 25 Aug. | Introduction: Historical Development of Systematics, Definitions, and Foundation | 1 | 1 - 22 |
| | | History - Systematics and taxonomy | 1 | 1 - 22 |
| 2 | 1 Sep | Methods of Phylogenetic Systematics (Tools) | 2 | 23 - 99 |
| | | More tools of the trade. Morphology - molecules | | |
| 3 | 8 Sep | Application of the Methods of Phylogenetic Systematics | 2 | 23 - 99 |
| | | Species Concepts | 3 | 100 - 172 |
| 4 | 15 Sep | Speciation – How do we study this? | 3 | 100 - 172 |
| | | Speciation – Describing Species and Diversity-why? | 3 | 100 - 172 |
| 5 | 22 Sep | Speciation – Models – Biogeography | 4 | 173 - 252 |
| | | Historical Biogeography - Cladistic Biogeography | 4 | 173 - 252 |
| 6 | 29 Sep | **EXAM - I - Take home exam. Due the next class period.** | | |
| | | Biogeography - Speciation - Methods of Study | 4 | 173 - 252 |
| | | Examples of Study of Adaptation - Phylogenetic | 5 | 253 - 352 |
| 7 | 6 Oct | Adaptations and Examples | 5 | 253 - 352 |
| | | Methods of comparing Trees - PACT - etc. | 5 | 253 - 352 |
| 8 | 13 Oct | DAMA - The Stockholm Paradigm | | |
| | | History of Studies - Adaptive Diversification | 6 | 373 - 416 |
| 9 | 20 Oct | Community Evolution - Brooks Historical Ecology | 7 | 417 - 464 |
| | | Cospeciation – Patterns and Processes / Coaccomodation | 8 | 465 - 524 |

| Week | | | Chapter | Pages |
|---|---|---|---|---|
| 11 | 27 Oct | Coevolution – Cospeciation/Coaccomodation | 8 | 465 - 524 |
| | | Biodiversity - exploration | 9 | 525 - 559 |
| 12 | 3 Nov | Biodiversity - exploration | 9 | 525 - 559 |
| | | Computer Programs for Phylogeny Reconstruction | Readings Assigned | |
| 13 | 10 Nov | Demonstrations and uses of PAUP, TNT, PHYLIP etc. | Readings Assigned | |
| 14 | 17 Nov | PACT - Demo<br>Rules of Nomenclature<br>PAPER - PROJECT - DUE | Readings Assigned | |
| 15 | 24 Nov | Names of Higher Taxa Kinds of Type Specimens | Readings Assigned | |
| | | **Visit to Collections – Field Trip - - - - Manter Laboratory** | | |
| * | | **Take Home Exam Given Out** | | |
| 16 | 1 Dec | Summary - Presentations of Final Projects | Readings Assigned | |
| | | Summary - Readings assigned | | |
| * | 8 Dec | **Project Presentations.** | | |
| | **12 Dec** | **Take home exam due. last day of class** | | |

**LECTURES:** Two Days/Week.

This course covers the history, development, practice, and application of methods and theory in Systematics with a focus on phylogenetic systematics from molecules to morphology and everything in between. Students will develop a broad understanding of systematics and the essential role of this field of inquiry and study in the study, description, and documentation of global biodiversity. Books to be used are listed on our web site. The two main books are: Wheeler, W.C. "Systematics: A course of lectures" and Brooks and McLennan: "The nature of diversity." Programs for phylogenetic analysis that we will explore and become adept in using include: Mesquite (by the Maddison's) and PAUP (David Swofford), PHYLIP (Felsenstein), and TNT (Goboloff, Willi Hennig Society) among others. Detailed principles of advanced phylogenetic inference will be use to further understanding of how to estimate phylogenetic relationships among groups. Phylogenetic diversity will be explored without regard to taxonomic group and will include investigations into bacterial symbionts (*Wohlbachia*) and their filarioid hosts in addition to many other groups. Current methods in use for comparison of phylogenetic trees will be covered as well as how to choose the best such trees for hypothesis testing. Students will be expected to choose a group from their own focus to investigate, develop a project, and present the results of the project to the class and invited participants. Naming of organisms will be covered in a general sense and nomenclature from viruses to mammals discussed and covered as well as basic taxonomic principles.

**Exams:**

**There Will Be 2 Exams.** Each exam is worth 100 points (2 exams = 200 points) with 100 points also coming from the paper/project. Total Points: There is a total of 300 points for the course.

**Contact me by phone: 472-3334 Leave a message and speak clearly and slowly.**

**Contact me by E-mail: slg@unl.edu** Write clearly and be concise!

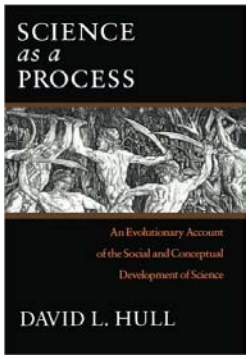
The two main books we will use are:

Daniel R. Brooks and Deborah A. McLennan The Nature of Diversity: An evolutionary voyage of discovery. University of Chicago Press. 676 pages. 2002.

Ward C. Wheeler. Systematics: A Course of Lectures. Wiley-Blackwell, 446 pages. May 2012.

Another book that will be invaluable in our course and for your development as a scientist is:

David Hull. Science as a Process. University of Chicago Press.



Ideas for Project / Paper.

1) Take a phylogeny that has been published and create a host-parasite type of mapping for that phylogeny. The point is that you should explore the literature, find an hypothesis that has been presented, look at ways of comparing phylogenies using mapping, or forcing, and present that in your analysis.

2) Compare a morphological vs. a molecular phylogeny by decomposing the trees using binary coding and mapping the trees together. Methods and subjects will be covered in class as we progress through the tree comparison techniques.

3) From the literature, create a cladogram for the geographic region, and map a cladogram over the region and compare the trees using the methods that we will cover in class. Use primary and secondary BPA.

4) Other ideas can be discussed and we will come up with some as we progress in the course.

Other Books:

Brooks, D. R. and McLennan, D. 2002. The Nature of Diversity. Univ. of Chicago Press.

Simpson, G.G. 1961. Principles of Animal Taxonomy. Columbia Univ. Press. Useful text. I will photocopy parts.

Mayr, E. And Ashlock, P. D. 1991. Principles of Systematic Zoology. McGraw Hill. I will photocopy parts.

Madison, W.P. and Madison, D.R. 1992. MacClade. Analysis of phylogeny and character evolution.

Swofford, D. PAUP Program: Phylogenetic Analysis Using Parsimony.