Philosophy of Biological Systematics: a short course  
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Natural History Museum of Los Angeles County

Course information
Dates: from July 11, 12, 13 and 16.  
Hours: From 9.00 a.m. to 6.00 p.m.  
Cost of course: Free.  
Registration: vsilpoly@gmail.com  
Place: Centro de Investigación en Ciencias del Mar y Limnología (CIMAR) and School of Biology, Universidad de Costa Rica

Systematics has become a field of research with many different and often conflicting perspectives and methods. How does one decide among these options? Is there a basis for critically evaluating how systematics should function as a science? Approaching the subject from the perspective of the philosophical foundations of science, 'Philosophy of Biological Systematics' is a unique course offering critical examinations of the principles required to judge the scientific merits of systematics. During this four-day course, we will examine the nature of scientific inquiry and what is required for systematics to operate within established principles of rational reasoning. From those basics we can readily judge such concepts as 'parsimony,' 'likelihood,' 'Bayesianism,' and their relations to systematics; we can evaluate what is required to test phylogenetic hypotheses; how to properly judge empirical support for hypotheses; and why popular approaches such as separate phylogenetic analyses of partitioned data and comparing cladograms are scientifically unacceptable.

The following topics will be covered

1. Introduction – what this course offers
2. The goal of science; the goal of biological systematics  
   a. the nature of understanding  
   b. basic foundations of scientific inquiry  
   c. systematics versus taxonomy
3. Causal relationships in systematics  
   a. taxa and causal understanding
4. The nature of why-questions
5. The three forms of reasoning: deduction, induction, abduction
6. The uses of deduction, induction, and abduction in science  
   a. defining fact, hypothesis, and theory  
   b. background knowledge  
   c. mechanics of theory and hypothesis testing  
   d. the meanings of evidence and support
7. Systematics involves abductive reasoning
8. Inferences of systematics hypotheses, i.e. taxa  
   a. the 'species problem' and its solution  
   b. specific and phylogenetic hypotheses/taxa
9. Some implications for 'phylogenetic' methods  
   a. the limits of phylogenetic hypotheses  
   b. relations between types of evidence in systematics  
   c. abductive reasoning and the myth of 'parsimony methods'  
   d. abductive reasoning and the myth of 'likelihood methods'  
   e. abductive reasoning and the myth of 'Bayesian phylogenetic methods'
10. Dating cladograms: a brief critique
11. The Requirement of total evidence (RTE)  
    a. relation of RTE to inference  
    b. relation of RTE to systematics  
    c. implications for systematics  
    d. the errors of cladogram comparisons and character mapping
12. Homology & homogeny & homoplasy  
    a. Richard Owen's use of homologue and homology  
    b. E.R. Lankester's replacement terms, homogen, homogeny, and homoplasy  
    c. implications of abductive reasoning for the utility of these concepts
13. Character coding  
    a. why character coding is necessary for systematics  
    b. accurately representing observation statements  
    c. character coding, why-questions, and the data matrix  
    d. problems with 'ordered' characters
14. Sequence data and phylogenetic inference: implications of top-down causation on the inclusion of sequence data
15. DNA barcoding: Caveat emptor
16. The mechanics of hypothesis testing in biological systematics  
    a. traditional misconceptions about testing phylogenetic hypotheses  
    b. mechanics of testing explanatory hypotheses, revisited  
    c. the uses of evidence, revisited  
    d. what is actually required to test phylogenetic hypotheses  
    e. the limits on acquiring causal understanding via phylogenetic hypotheses  
    f. the myths of support measures: bootstrap, jack-knife, Bremer, etc.
17. Implications for nomenclature
18. Defining biodiversity and conservation