ANNOUNCEMENT:
I am again offering my *Philosophy of Biological Systematics* course via Zoom, from 15 May to 30 June 2023. The course is open to anyone involved in systematics research or with an interest in systematics.
Contact me at kfitzhugh@nhm.org to register or if you have any questions.
Please share the additional specific information provided below with anyone you think might be interested.
Thanks,
Kirk Fitzhugh

PHILOSOPHY OF BIOLOGICAL SYSTEMATICS*: *a short course

Kirk Fitzhugh, Natural History Museum of Los Angeles County

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 21-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 more readily (a) judge such concepts as “parsimony,” “likelihood,” “Bayesianism,” and their relations to systematics; (b) evaluate what is required to test phylogenetic hypotheses; (c) determine how to judge the empirical support for hypotheses; and (d) understand why popular approaches such as separate phylogenetic analyses of partitioned data, cladogram comparisons, and character mapping are scientifically unacceptable.

Course logistics:
• Contact Kirk Fitzhugh, kfitzhugh@nhm.org, to register or if you have any questions
• Registration is free
• Registered participants should plan to attend all lectures since each lecture provides a cumulative foundation for subsequent lectures
• Registered participants will receive a 1,400+ page pdf containing all course slides and notes
• A course certificate will be provided upon request after course completion
• Lectures will be via Zoom; Mondays, Wednesdays, Fridays
10 am – 1:45 pm Pacific daylight savings time (-7 UTC), with a 15-minute break, and 30-minute question/comment period at the end of each day’s lecture period
• Twenty-one lectures, during seven weeks:
Week 1 - May 15, 17, 19
Week 2 - May 22, 24, 26
Week 3 - May 29, 31, June 2
Week 4 - June 5, 7, 9
Week 5 - June 12, 14, 16
Week 6 - June 19, 21, 23
Week 7 - June 26, 28, 30

The following topics will be addressed:
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, theory, and hypothesis
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. taxa are explanatory hypotheses, per the goal of scientific inquiry
b. the “species problem” and its solution
c. abductive inferences of specific and phylogenetic hypotheses/taxa
9. Some implications for “phylogenetic” methods
a. the limits of phylogenetic hypotheses
b. beware of “tree thinking”
c. relations between types of evidence in systematics
d. abductive reasoning versus “parsimony methods”
e. abductive reasoning versus “likelihood methods”
f. abductive reasoning versus “Bayesian methods”
10. Dating cladograms: a (very) brief critique
a. to what explanatory hypotheses implied by cladograms are dates applied?
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 significant errors of cladogram comparisons and character mapping
12. Homology & homogeny & homoplasy: are these terms needed?
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 and the RTE 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
14. Sequence data and phylogenetic inference: implications of top-down causation on considering sequence data
a. sequence data, genetic drift, natural selection
b. sequence data, why-questions, and the data matrix
c. top-down causation
d. can we really explain shared nucleotides?
15. The “species delimitation” myth
a. once again, species are explanatory hypotheses, not entities, things, individuals, etc.
b. “species delimitation” methods
c. the misconceptions of “gene trees” versus “species trees”
d. implications of the RTE for “delimitation” methods
e. examples of the failure of “delimitation” methods
f. take-home message: inferences of specific hypotheses cannot be accomplished via phylogenetic inferences
16. DNA barcoding: caveat emptor
a. barcoding as pure research versus barcoding as applied research
b. barcoding cannot be justified as part of pure systematics research, i.e. inferring specific or phylogenetic hypotheses
c. barcoding is justified as applied research under very limited conditions
17. 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.
18. Implications for nomenclatural systems
19. Defining biodiversity and conservation; do we need the term “biodiversity?”