

Philosophy 920 – Fall 2006 – Evidence and Evolution

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This seminar will begin with a general consideration of the concept of evidence, using tools from probability theory. In this early part of the seminar, we'll consider Bayesian, likelihoodist, and frequentist ideas. The rest of the seminar will apply these tools to questions about evidence that arise in connection with evolutionary theory. One topic we'll consider briefly is creationism and intelligent design, but the rest are internal to evolutionary biology. The main focus will be on questions that arise in connection with testing (i) hypotheses about phylogenetic relationships (e.g., why think that the species we currently observe have common ancestors?) and (ii) hypotheses about natural selection. Students who take this course may want to prepare for it over the summer by reading my textbook *Philosophy of Biology* and Ian Hacking's textbook *An Introduction to Probability and Inductive Logic*.

The syllabus for this course draws on the one used by David Baum, Bret Larget, and Ken Systma in their Botany 940 course, taught in Spring 2006, which also was called *Evidence for Evolution*. The web site for their course may be found at http://www.botany.wisc.edu/courses/botany_940/.

I've order Darwin's *Origin of Species* (facsimile of first edition, Harvard UP) and P. Harvey and M. Pagel's *The Comparative Method in Evolutionary Biology* (OUP, 1991) at University Bookstore. There will a compilation of photocopies of some items on the syllabus that are not available on the web. In addition, we'll read a book manuscript I am working on called *Evidence and Evolution*, referred to below as E&E.

My office hours are Tuesday and Thursday 2:30-3:30, or by appointment. My office is 5199 Helen C. White Hall.

Week	Date	Topic and Readings
1	Sept 6	Introduction: seminar plan and discussion of questions you may have about Sober <i>PB</i> and Hacking <i>IPIL</i> .
2	Sept 13	Bayesianism, Likelihoodism, and Frequentism: E&E 1.1–1.6; handout on confidence intervals on my web site.
3	Sept 20	S. Goodman and R. Royall, "Evidence and Scientific Research." <i>Amer J. of Public Health</i> (1988) 78: 1568-1574; S. Goodman, "Toward Evidence-Based Medical Statistics I – the P-value Fallacy" <i>Ann Intern Med.</i> (1999) 130: 995-1004;. S. Goodman, "Toward Evidence-Based Medical Statistics 2 – the Bayes Factor." <i>Ann. Intern. Med.</i> (1999) 130: 1005-1013,
4	Sept 27	D. Mayo, "Why You Cannot be Just a Little Bit Bayesian." In <i>Error and the Growth of Experimental Knowledge</i> , ch. 10, U Chicago Press, 1996, pp. 319-361.
5	Oct 4	Models and Model Selection Theory: E&E 1.7-1.9; M. Forster and E. Sober, "How to Tell When Simpler, More Unified, or Less <i>Ad Hoc</i> Theories will Provide More Accurate Predictions." <i>Br. J. Phil. Sci.</i> (1994) 45: 1-36.
6	Oct 11	Intelligent Design: E&E, ch. 2.

7	Oct 18	C.G. Hempel, "Empiricist Criteria of Cognitive Significance – Problems and Changes." In <i>Aspects of Scientific Explanation and Other Essays</i> . New York: Free Press, 1965, pp. 99-122; D. Povinelli, "Reconstructing the Evolution of Mind." <i>American Psychologist</i> (1993) 48: 493-509. D. Dennett, "Skinner Skinned," in <i>Brainstorms</i> , MIT Press, 1978.
8	Oct 25	Natural Selection: Philip Kitcher, "Darwin's Achievement;" in <i>In Mendel's Mirror</i> . Oxford UP, 2005, pp. 45-93; M.J.S. Hodge, "Natural Selection as a Causal, Empirical, and Probabilistic Theory." In L. Kruger, G. Gigerenzer, and M. Morgan (eds.), <i>The Probabilistic Revolution</i> , vol. 2, MIT Press, 1987, pp. 233-270
9	Nov 1	E&E 3.1-3.6; Origin, chs. 3, 4, and 6.
10	Nov 8	E&E, 3.6-3.12. D. Baum and A. Larson, "Adaptation Reviewed – a Phylogenetic Methodology for Studying Character Coevolution." <i>Systematic Zoology</i> 40: 1-18; Selections from P. Harvey and M. Pagel, <i>The Comparative Method in Evolutionary Biology</i> , 1991, Oxford University Press.
11	Nov 15	Harvey and Pagel, (cont'd).
12	Nov 19	Similarity as evidence for common ancestry: E&E 4.1-4.7
13	Nov 29	Agreement across data sets on which tree is best: E&E 4.8; D. Penny, L. Foulds, M. Hendy, "Testing the theory of evolution by comparing phylogenetic trees constructed from five different protein sequences," <i>Nature</i> (1982) 297: 197-200. Fossils: E&E 4.8; Origin, chs.9 and 10; D. Penny, M. Hendy, and A. Poole, "Testing Fundamental Evolutionary Hypotheses," <i>Journal of Theoretical Biology</i> (2003) 223: 377-385..
14	Dec 6	Biogeography: E&E 4.8; Origin, chs.11 and 12; Phylogenetic inference: E&E 4.9; J. Felsenstein, "Cases in which Parsimony and Compatibility Methods can be Positively Misleading." <i>Systematic Zoology</i> 27: 401-410..
15	Dec 13	M. Steel and D. Penny, "Parsimony, Likelihood and the Role of Models in Molecular Phylogenetics," <i>Molecular Biology and Evolution</i> (2000) 17: 839-850; J. Huelsenbeck, F. Ronquist, R. Nielsen, J. Bollback, "Bayesian Inference of Phylogeny and Its Impact on Evolutionary Biology." <i>Science</i> (2001) 294: 2310-2314.