Last updated: 1/16/06

IB 166 SYLLABUS

(Subject to Modification Depending on Time and Interests)

Websites:
General Information http://ib.berkeley.edu/labs/barnosky/IB166Webpage.htm
Enrolled students get course materials from http://blackboard.berkeley.edu:8000/

IB 166. EVOLUTIONARY BIOGEOGRAPHY. Spring 2006

Instructor: Prof. A.D. Barnosky
GSI: Jenny McGuire

Time and Place:
Lecture-WF 10-11:30P, 3007 VALLEY LSB
Discussion Section- S 101 DIS M 2-3P, 166 S 102 DIS W 9-10A 3007 VALLEY LSB

Prerequisites: Bio 1B, Bio 11, Geog 148, or Geol 50.

Brief Description: 4 units. Three hours of lecture and one hour of discussion per week. Explores how biogeographic processes influence evolution of species, communities, and ecosystems. Provides background and analytical techniques for studying effects of global change on biota.

More Details: The goals of the course are to (a) examine how geographically-linked characteristics of species influence their potential for evolution and extinction; and (b) provide an overview of the analytical techniques and applications for studying the interplay between geographic ranges, environment, evolution, and extinction. The course will begin by examining what geographic ranges of species are and what controls them (~5 hours of lecture). We then will explore how geographic-range characteristics influence and interact with speciation and extinction processes (~8 hours of lecture). With that foundation, we will examine interactions of species within communities, touching on such topics as community energetics, scaling issues, and the influences of humans on "natural" ecosystems (~11 hours of lecture). The last third of the course will be devoted to an overview of quantitative analytical techniques that commonly are used to study interactions between biogeogeographic ranges, evolutionary processes, extinction, and environmental change (~12 hours of lecture). Topics in this part of the course will included island biogeography, biodiversity, phylogenetics, phylogeography, cladistic biogeography, parsimony analysis of endemicity, geographic information systems, etc. The final week (~3

hours of lecture) will summarize how some of these analytical techniques can be applied to understand biotic response to global change.

Texts:

1. *Lomolino, M. V., Riddle, B. R., and Brown, J. H. 2006.* Biogeography, 3rd Edition. Sinaur.

2. *Lomolino, M. V., Sax, D. R. and Brown, J. H. 2004.* Foundations of Biogeography, Classic Papers with Commentary. University of Chicago Press.

3. *plus 1-2 articles per week* from the primary literature.

Grading: 1 midterm (20%), 1 final (30%), research paper written in a style acceptable for *Journal of Biogeography* (30%), participation in class and discussion section (20%).

Week 1 Jan 16-20: Concept of Geographic Range

Course Introduction Chapter 1, pp. 3-12
Overview of Geographic Range Concept Chapter 4, pp. 65-96

Grinnell, J. 1922. The role of the accidental. Auk 39:373-80. [In Foundations of Biogeography, p. 456]
Fernandez, M.H., Vrba E.S. 2005. Body size, biomic specialization and range size of African large mammals. J. Biogeog. 32(7): 1243-1256.

Discussion Reading
1. *Crisci (2001). J. Biogeog. 28: 157-68.*
2. *Cleland (2001). Geology 29: 987-90*

Week 2 Jan 23-27: Controls on Geographic Ranges

Physical Controls Chapter 3, pp. 39-64

Species Interactions

Historical Constraints Chapter 6, pp. 139-154, Chapter 8, pp. 227-248

Discussion Reading

1. Grinnell, J. 1922. The role of the accidental. Auk 39:373-80. [In Foundations of Biogeography, p. 456]

2. *Agapow, P.-M.; Bininda-Emonds, O. R. P., et al. (2004). The impact of species concept on biodiversity studies. Quarterly Review of Biology 79(2): 161-179.*

Week 3 Jan 30 – Feb 3: Geographic Ranges and Speciation

Species Concepts Chapter 7, pp. 177-189

Gene Flow Chapter 15, pp. 567-584

Speciation Models Chapter 7, pp. 189-213

Discussion Reading

1. Rensch, B. 1960. Excerpt from Evolution Above the Species Level. [In Foundations of Biogeography, p. 789]

2. *Plus1 article from current literature TBA*

Week 4 Feb 6-10: Geographic Ranges and Speciation

Dispersal Chapter 6, pp. 154-176

Vicariance Chapter 8, 248-268

Discussion Reading

1. Hallam, A. 1967. The bearing of certain palaeozoogeographic data on continental drift. Palaeogeography, Palaeoclimatology, Palaeoecology 3:201-41. [In Foundations of Biogeography, p. 366]

2. *Plus 1 article from current literature TBA*

Week 5 Feb 13-16: Geographic Ranges and Extinction

Endemism / Provincialism Chapter 10, pp. 295-322

Extinctions in the Fossil Record Chapter 8, pp. 269-274, Chapter 9 312-323

Current Extinctions Chapter 16, pp. 657-678; Chapter 17, 715-728

Discussion Reading

1. Martin, P. S. The discovery of America. Science 179:969-974. [In Foundations of Biogeography, p. 641]

2. Plus 1 article from current literature TBA

Week 6 Feb 20-24: Species Aggregates-Communities

Community Energetics Chapter 5, pp. 95-138

Describing Communites and Ecosystems Chapter 15, 585-598

Modern Distribution of Biomes

Discussion Reading

1. Whittaker, R. H. and W. A. Niering 1975. Vegetation of the Santa Catalina Mountains, Arizona, V: Biomass, Production and Diversity along the Elevational Gradient. Ecology 56:771-790. [In Foundations of Biogeography, p. 1254]

2. Plus 1 article from current literature TBA

Week 7 Feb 27 – Mar 3: Community Evolution

Scales of Community Change

Geological Time Scale Chapter 8, pp. 227-248

Quaternary Time Scale Chapter 9, pp. 276-311

Discussion Reading

1. Valentine, J. W. 1969. Patterns of taxonomic and ecological structure of the shelf benthos during Phanerozoic time. Paleontology 12:684-709. [In Foundations of Biogeography, p. 875]

2. *Plus 1 article from current literature TBA*

Week 8 Mar 6 -10: Community Evolution

Human Time Scale and Biodiversity Crisis Chapter 16, pp. 643-656

Physical Forcing of Community Evolution

Biotic Forcing of Community Evolution

Discussion Reading

1. Darlington, P. J., Jr. 1957. Excerpt from Zoogeography: The Geographic Distribution of Animals. [In Foundations of Biogeography, p. 1036]

2. Plus 1 article from current literature TBA

Week 9 March 13 -17: Human Influence on Biological Communities

MIDTERM: March 17

Origin and Spread of Humans Chapter 17, pg. 728-744

Ecosystem Management

Discussion Reading

1. Elton, C. S. 1958. Excerpt from the Ecology of Invasions by Animals and Plants. [In Foundations of Biogeography, p. 575]

2. Plus 1 article from current literature TBA

Week 10 March 20-24: Evolution of Diversity

~~Island Biogeography Theory Chapter 13, pp. 469-512~~

Island Biogeography Chapter 14, 515-562

Diversity on Continents Chapter 15, pp. 599-639

Levels of Diversity

Discussion Reading

1. Arrhenius, O. 1921. Species and area. Journal of Ecology 9:95-99. [In Foundations of Biogeography, p. 942]

2. Pianka, E. R. Latitudinal gradients in species diversity: a review of concepts. The American Naturalist 100:33-46. [In Foundations of Biogeography, p. 1203.

3. Plus 1 article from current literature TBA

Week 11 March 27-31: Spring Break

Week 12: Measuring Diversity (April 3-7)

Strengths and Weaknesses in Island Biogeographic Theory

Island Patterns

Sampling Problems in Space and Time

Discussion Reading

1. MacArthur, R. H. and E. O. Wilson. 1963. An equilibrium theory of insular zoogeography. Evolution 17:373-387. [In Foundations of Biogeography, p. 970]

2. *Plus 1 article from current literature TBA*

Week 13: Interpretation of Biogeographic Data (April 10-14)

Fossils in Biogeography Chapter 11, 408-418

Early Efforts Chapter 2, 13-38; Chapter 12, 422-435

Discussion Reading

1. Darwin, C. 1859. Excerpts from On the Origin of Species by Means of Natural Selection, or the Preservation of Favored Races in the Struggle for Life. [In Foundations of Biogeography, p. 140]

2. *Plus 1 article from current literature TBA*

Week 14: Interpretation of Biogeographic Data (April 17-21)

Phylogenetics Chapter 11, 389-403

Molecular Systematics

Discussion Reading

1. Hennig, W. 1966. Excerpt from Phylogenetic Systematics. [In Foundations of Biogeography, p. 679]

2. *Plus 1 article from current literature TBA*

Week 15: Interpretation of Biogeographic Data (April 24-28)

Phylogeography Chapter 11, pp. 404-409; Chapter 12, pp. 450-453

Cladistic Biogeography, Parsimony Analysis of Endemicity Chapter 12, pp. 436-449, 454-466

Hubbell's Neutral Theory

GIS, Remote Sensing

Discussion Reading

1. Nelson, G. J. 1974. Historical biogeography: an alternative formalization. Systematic Zoology 555-558. [In Foundations of Biogeography, p. 705]

2. *Plus 1 article from current literature TBA*

Week 16: Current and Future Applications (May 1-5)

Conservation Biology, Global Change Chapter 16, pp. 678-708, Chapter 17, pp. 709-715

Applications for the Future Chapter 18, pp. 745-751

Discussion Reading

1. 2 articles from current literature TBA