

## Introduction to Biogeography

This course will present an **integrated** study of past, present and likely future distribution of Earth's biological diversity. The distribution of flora and fauna through space and time at multiple spatial and temporal scales will be discussed. We will be concerned with identifying how abiotic factors such as soils, climate and topography affect the geographic and spatial distribution of individuals, species, ecosystems and biomes. Additionally, we will discuss how biotic and historical factors have influenced the past and present distribution of organisms. We will also focus on how human modification of the Earth Atmosphere System (EAS) has impacted Earth's biota and what approaches are being taken to aid in understanding and conserving endangered and threatened species and biodiversity.

Time: Mon/Weds. 11:00 — 12:48 pm

Location: Derby Hall (DB) 0150

Instructor: Dr. David Porinchu

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Office Hours: Monday and Wednesday, 2-3:30 p.m.

### **Course Format/Structure:**

This will primarily be a lecture-based course. However, a significant component of the class will involve group discussions. These discussions will require active student involvement. Additionally, in-class assignments and lab exercises will provide students with hands-on experience. The lab exercise, i.e. *Paleoenvironmental Lab*, will cover topics and methods that supplement the lecture material. Students will be expected to complete a term paper focusing on a biogeographic topic to be determined in consultation with the instructor. Guidelines for writing term papers will be made available early in the quarter. Students will also make a short presentation on a biome of their choice. Students are strongly encouraged to attend all lectures and obtain notes for those lectures that they may have missed. A make-up exam is possible in the event of a documented emergency or through **prior** consent of the instructor.

Please visit and familiarize yourselves with the student **Student Code of Conduct**

webpage: [http://studentaffairs.osu.edu/resource\\_csc.asp](http://studentaffairs.osu.edu/resource_csc.asp).

### **Disability Statement**

Students with physical or learning disabilities requiring alternative accommodations for completing course requirements must make these arrangements in consultation with the University Office of Disability Services (150 Pomerene Hall, 2-3307) and the instructor **at the beginning of the quarter**.

**Reading Materials:**

The primary source of material for this course will be the following textbook:  
MacDonald, G. M (2003). *Biogeography: Time, Space and Life*. Wiley, New York.  
518 pp.

Additional readings will be assigned on a weekly basis. An abbreviated list of these readings can be found following the lecture-reading outline.

**Grading:**

Biome presentation and write-up	10 %
Mid-term exam	25 %
Term paper	25 %
Term paper presentation	5 %
Lab exercise	15 %
Participation	10 %
Reading responses	10 %

**Course Lecture-Reading Outline:****Week 1**

Introduction: review of hierarchies (taxonomic, ecologic and trophic), and physical geography basics (global climate, microclimate and soils). Additional topics include introduction to gradients of diversity and how many species exist. [Chapters 1,2; Diamond, 1987; May, 1988]

**Week 2**

Discussion of how abiotic factors such as light, temperature and moisture control the distribution of biota. Environmental gradients and the concept of species' niches will also be introduced. Additional topics include discussion of other physical factors and the interaction of abiotic factors on geographical distributions. [Chapter 3; Jansen, 1967; Stevens, 1992; Gaston et al., 1998]

**Week 3**

Discussion of how biotic factors such as predation, competition and symbiosis affect species interactions and community composition. The combined effects of biotic and abiotic factors on biodiversity will be discussed. Additional topics include discussion of ecosystems and biodiversity and biotic assemblages on a global scale. [Chapter 4; Savidge, 1987, Roemer et al., 2002; Hierro et al., 2005]

**Week 4**

Presentation and student-led discussion of community formations and biomes [Chapter 6; plus additional readings].

**Week 5**

Discussion of major forms of disturbance, including fire, flooding and wind. Additional physical disturbances such as avalanches, volcanic eruptions and pathogens will also be reviewed. [Chapter 5; Swetnam, 1993; Wootton, 1998].

**Week 6**

Discussion of life and the geologic timescale, plate tectonics and Quaternary climate change. Additional topics will include climatic relicts, early spread of mammals, the Cretaceous extinction event and the rise of flowering plants. [Chapter 7; Erwin, 2001; Steadman and Martin, 2003]

### **Week 7**

Discussion of dispersal, colonization and invasion and the role of geography in evolutionary processes. Additional topics include Darwin's theory of evolution through natural selection, Darwin's finches, controversies associated with evolutionary theory, evolution and human race(s) and Social Darwinism. [Chapters 8, 9; Gould and Eldredge, 1993; Grant and Grant, 2003]

### **Week 8**

The role of humans as a factor in evolution and extinction. Specific reference will be made to: animal and plant domestication, the spread of agriculture and pre-historic and historic extinctions. Additional topics will include the role of humans in mega-faunal extinctions and the environmental impact of early human cultures. [Chapters 11, 12; Martin, 1973; Barnosky et al., 2004; Pennisi, 2004]

### **Week 9**

Discussion of the relationship between geography, biodiversity and conservation. Further discussion will focus on understanding how a geographical perspective can inform strategies for species conservation and biodiversity conservation. Additional topics include Island Biogeography, the biogeographical consequences of global climate change, design of nature reserves, habitat restoration and conservation and biodiversity hotspots. [Chapters 14, 15; Diamond, 1975; Soule, 1985; Meadows, 2001; Myers, 2003]

### **Week 10**

Students will present their term paper topics and lead discussion.

### **Additional Readings**

- Barnosky, A. D., Koch, P. L., Feranec, R. S., Wing, S. L. and Shabel, A. B. 2004. Assessing the causes of Late Pleistocene extinctions on the continents. *Science* 306: 70-75.
- Cooney, R. 2004. Better safe than sorry? The precautionary principle and biodiversity Conservation. *Oryx* 38: 357-358.
- Cox, C. B. and Moore, P. M. 2000. Biogeography: An ecological and evolutionary approach. Blackwell: London, UK. 298 pp.
- Diamond, J. M. 1975. The island dilemma: Lessons of modern biogeographic studies for the design of natural reserves. *Biological Conservation* 7: 129-146.
- Diamond, J. D. 1987. Extant unless proven extinct? Or, Extinct unless proven extant? *Conservation Biology* 1: 77-79.
- Erwin, D. H. 2001. Lessons from the past: Biotic recoveries from mass extinctions. *Proceedings of the National Academy of Sciences* 98: 5399-5403.
- Gaston, K. J., Blackburn, T. M. and Spicer, J. I. 1998. Rapoport's rule: time for an epitaph? *Trends in Ecology and Evolution* 13: 70-74.
- Gould, S. J. and Eldredge, N. 1993. Punctuated equilibrium comes of age. *Nature* 366: 223-227.
- Grant, B. R. and Grant, P. R. 2003. What Darwin's finches can teach us about the evolutionary origin and regulation of biodiversity. *Bioscience* 53: 965-975.
- Hierro, J. L., Maron, J. L. and Callaway, R. M. 2005. A biogeographical approach to plant invasions: the importance of studying exotics in their introduced and native range. *Journal of Ecology* 93: 5-15.
- Jansen, D. H. 1967. Why mountain passes are higher in the tropics. *The American Naturalist* 101: 233-249.

- Kingsland, S. 2002. Creating a science of nature reserve design: Perspectives from history. *Environmental Modeling and Assessment* 7: 61–69.
- Lack, D. 1947. *Darwin's Finches*. Cambridge University Press: Cambridge, MA. 264 pp.
- MacArthur, R. H. 1972. *Geographical Ecology: Patterns in the Distribution of Species*. Harper and Row: New York. 288 pp.
- Martin, P. S. 1973. The discovery of America. *Science* 179: 969-974.
- May, R. M. 1988. How many species are there on Earth? *Science* 358: 278-279.
- Meadows, M. 2001. Biogeography: does theory meet practice? *Progress in Physical Geography* 25: 134–142.
- Miller, J. and Hobbs, R. 2003. Conservation where people live and work. *Conservation Biology* 16: 330-337.
- Mittermeier, R. A., Mittermeier, C. G., Brooks, T.M., Pilgrim, J.D., Konstant, W.R., da Fonseca, G. A. B. and Kormos, C. 2003. Wilderness and biodiversity conservation. *Proceedings of the National Academy of Sciences* 100: 10309-10313.
- Myers, N. 1990. The biodiversity challenge: expanded hot-spot analysis. *Environmentalist* 10: 243-256.
- Myers, N. 2003. Biodiversity hot spots revisited. *Bioscience* 53: 916-917.
- Nelson, G. J. 1969. The problem of historical biogeography. *Systematic Zoology* 18: 243-246.
- Pennisi, E. 2004. Ice ages may explain ancient bison's boom-bust history. *Science* 306: 1454.
- Roemer G. W., Donlan C. J. and Courchamp, F. 2002. Golden eagles, feral pigs, and insular carnivores: How exotic species turn native predators into prey. *Proceedings of the National Academy of Sciences* 99: 791-796.
- Savidge, J. A. 1987. Extinction of an island forest avifauna by an introduced snake. *Ecology* 68: 660-668.
- Simberloff, D. S. and Abele, L. G. 1982. Refuge design and island biogeographic theory: effects of fragmentation. *American Naturalist* 120: 41-50.
- Simpson, G. G. 1940. *Mammals and Land Bridges*. Publication No. 30, National Academy of Sciences: Washington, D.C. pp. 137-63.
- Soule, M. E. 1985. What is conservation biology? *Bioscience* 35: 727-734.
- Steadman, D. W. and Martin, P. S. 2003. The late Quaternary extinction and future resurrection of birds on Pacific islands. *Earth-Science Reviews* 61: 133-147.
- Swetnam, T. W. 1993. Fire history and climate-change in giant sequoia groves. *Science* 262: 885-889.
- von Humboldt, A. 1805. Essay on the geography of plants. Society for the Bibliography of Natural History, Sherborn Fund Facsimilies No.1.
- Wallace, A. 1876. "Summary of the distribution, and lines of migration, of the several classes of animals" in, *The Geographical Distribution of Animals*. 2 vols. MacMillan: London.
- Wallace, A. 1880. *Island Life: Or, the Phenomena and Causes of Insular Faunas and Floras*. Macmillan: London, UK. 522 pp.
- Wootton, J. T. 1998. Effects of disturbance on species diversity: a multi-trophic perspective. *American Naturalist* 152:803-825.