

**GEOGRAPHY 490**  
**Introduction to Biogeography**  
**Autumn 2009**

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. 10:30 — 12:18 pm*

*Location: Derby Hall (DB) 1116*

*Instructor: Dr. David Porinchu*

*Office: 1128 Derby Hall*

*Phone: 247-2614*

*Email: porinchu.1@osu.edu*

*Office Hours: Tuesday and Thursday, 10:00 – 11:30 a.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, a field trip to a nearby field site will provide students with hands-on experience in paleoecological field methods and analyses. The field trip and the associated lab exercise will introduce students to 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.

**Academic Misconduct**

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct ([http://studentaffairs.osu.edu/info\\_for\\_students/csc.asp](http://studentaffairs.osu.edu/info_for_students/csc.asp)).

## **Disability Statement**

Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.

## **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.

## **Evaluation:**

Reading responses – 20 %  
Biome presentation and write-up – 10 %  
Paleoenvironmental Fieldtrip and Laboratory – 10%  
Mid-term exam – 20 %  
Term paper – 25 %  
Term paper presentation – 5 %  
Participation – 10 %

## **Course Lecture-Reading Outline (subject to change)**

### **Week 1**

Introduction: review of physical geography basics (global climate, microclimate and soils), species concept and hierarchies (taxonomic, ecologic and trophic). Additional topics: variations within species, heredity, how many species exist. [Chapters 1,2; Darwin 1859, Wallace 1876, Diamond 1987, May 1988, Erwin 1991, Stork 1993]

### **Week 2**

Discussion of how abiotic factors such as light, temperature and moisture control the distribution of flora and fauna. Environmental gradients and the concept of species' niches will also be introduced. Additional topics include: gradients of species diversity. [Chapter 3, Pianka 1966, Jansen 1967, Stevens 1989, Gaston et al. 1998, Sax 2001]

### **Week 3**

Discussion of how biotic interactions such as predation, competition and symbiosis affect species distribution and community composition. The combined effects of biotic and abiotic factors on biodiversity will be discussed. [Chapter 4, Temple 1977, Savidge 1987, Roemer et al. 2002]

**Week 4**

Discussion of natural selection theory (mutations, genetic drift), selection in action and speciation in the Galapagos Islands [Chapter 6; Lack 1947, Grant and Grant 2003, Young 2003].

**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, Westerling et al. 2006].

**Week 6**

Discussion of life and the geologic timescale, hierarchy of life, plate tectonics and Quaternary climate change. Additional topics include: climatic relicts, early spread of mammals, punctuated equilibrium. [Chapter 7, Simpson 1940, Gould and Eldredge 1993, Erwin 2001]

**Week 7**

Discussion of dispersal, colonization and invasion and the role of geography in evolutionary processes. Additional topics include: evolution and humanity, Social Darwinism, sociobiology. [Chapters 8, 9; Wilson 1976, Sociobiology Study Group 1976, Wilson and Wilson 2007]

**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, Steadman and Martin 2003, Barnosky et al. 2004, Pennisi, 2004, Sloan 2007]

**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: biogeographical consequences of global climate change, design of nature reserves, habitat restoration and conservation and biodiversity hotspots. [Chapters 14, 15; Soule 1985, Meadows 2001, Myers 2003, Thomas et al. 2004, Schwartz et al. 2006]

**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.
- Darwin, C. 1859. On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life. MacMillan: London
- 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. 1991. How many species are there? Revisited. *Conservation Biology* 5: 330-333.
- 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.
- Pianka, E. 1966. Latitudinal gradients in species diversity: a review of concepts. *The American Naturalist* 100: 33-46

- 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.
- Sax D.F. 2001. Latitudinal gradients and geographic ranges of exotic species: implications for biogeography. *Journal of Biogeography* 28: 139-150.
- 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.
- Stork N.E. 1993. How many species are there. *Biodiversity and Conservation* 2: 215-232.
- Swetnam, T. W. 1993. Fire history and climate-change in giant sequoia groves. *Science* 262: 885-889.
- Thomas C.D., Cameron A., Green R.E., Bakkenes M., Beaumont L.J., Collingham Y.C., Erasmus B.F.N., de Siqueira M.F., Grainger A., Hannah L., Hughes L., Huntley B., van Jaarsveld A.S., Midgley G.F., Miles L., Ortega-Huerta M.A., Peterson A.T., Phillips O.L. and Williams S.E. 2004. Extinction risk from climate change. *Nature* 427: 145-148.
- Temple S.A. 1977. Plant-Animal Mutualism - Coevolution with Dodo Leads to near Extinction of Plant. *Science* 197: 885-886.
- 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.
- Westerling A.L., Hidalgo H.G., Cayan D.R. and Swetnam T.W. 2006. Warming and earlier spring increase western US forest wildfire activity. *Science* 313: 940-943.
- Wilson E.O. 1976. Academic Vigilantism and Political Significance of Sociobiology. *Bioscience* 26: 183.
- Wilson, D.S and Wilson, E.O. 2007. Rethinking the theoretical foundation of sociobiology. *The Quarterly Review of Biology* 82: 327-348.
- Wootton, J. T. 1998. Effects of disturbance on species diversity: a multi-trophic perspective. *American Naturalist* 152:803-825.
- Young K.R. 2003. Genes and biogeographers: Incorporating a genetic perspective into biogeographical research. *Physical Geography* 24: 447-466.