

**Instructor:** Dr. S. Hecnar    **Office:** CB 4039    **Tel:** 343-8250    **Email:** shecnar@lakeheadu.ca

**Lectures:** 10:00 -11:30 am T & TH in BB 1021

**Office hours:** 11:30 am -12:30 pm T & TH

**Website:** <http://shecnar.lakeheadu.ca/>

**TA:** Darlene Hecnar: drhecnar@lakeheadu.ca

**Course Description:** A study of the distribution and dispersal of organisms. [An examination of how biotic and abiotic factors interact and species distributions respond to dynamic environmental processes such as climate and glaciation. Topics covered include: history of biogeography, distributions of species, communities, and biomes; speciation and extinction, endemism, dispersal, history of lineages and biotas, patterns of continental and oceanic diversity, island biogeography, and human impacts on species distribution. Lecture concepts are complemented by quantitative assignments in a workbook and journal article critiques.]

**Required Textbook:** Lomolino, M.V., B.R. Riddle, and R.J. Whittaker. 2017. *Biogeography: Biological Diversity Across Space and Time. fifth edition.* Sinauer. ISBN: 978-1-60535-472-9

**Optional Materials:** Lectures can be downloaded gratis from the Desire2Learn (D2L) website for the course. These slides can provide a good basis for notes but are **not** a substitute for attending class. Those that rely only on downloaded lectures will miss out on material that is covered verbally and ultimately used for exam questions.

**Marking Scheme:** Midterm 35%, Problem Work Book 15%, Final Exam 50%

**Examination Dates:** Midterm Tuesday Feb 28th, Final Exam T.B.A.

**General Information:** The short course description belies the complexity of biogeography. Consequently, we will cover a lot of material. Although there are not specific prerequisites, I assume that students understand basic ecological principles and are familiar with general geography of the world. Maintaining good attendance is for your own benefit. Examination questions often come from poorly attended lectures. Missed examinations will be graded zero unless you have an acceptable excuse and supporting documentation (see official university regulations). If you have a contagious illness, please refrain from attending class and check with the instructor after you recover to ensure that you are up to date. If you do miss, or expect to miss an exam, contact the instructor as soon as possible. Noise or distractions during lectures or exams will not be tolerated. Cell phones must be turned off during lecture. Laptop or notebook computers are allowed in class for note taking only.

**Assignments:** There are two assignments, a problem workbook and a journal assignment, both are **due at the end of the lecture on Thursday March 30 2017**. The problem work book can be downloaded gratis from the Desire 2Learn site. This work book contains quantitative sample problems related to concepts covered in lecture. Students are required to read two papers on biogeographical topics from the primary literature (journals). A one page report summarizing and critiquing each paper (which must be fully cited) must be handed in with the completed workbook. The papers will be checked for accuracy and assessed on a pass/fail basis and will be considered when calculating final marks. Reports submitted must be in

your own words. Plagiarism will result in a grade of '0' (zero) being assigned. If assignments are not received by the time of the final exam, an incomplete grade will be assigned.

**Further Reading for Interested Students:** The Paterson Library has a considerable, albeit somewhat dated, number of volumes in biogeography. However, electronic subscription packages allow access to pdf versions of papers in several biogeographical journals. You can also access numerous pdfs of published papers by doing keyword searches on Google Scholar. If you are interested in a particular subtopic, seek out references cited in your text or see the instructor for advice.

**Journals:**

*Journal of Biogeography* - the primary journal of the discipline. QH 84 J86. (Paper 1974-1984, 1987-1995, electronic 1996-).

*Biodiversity and Conservation* - basic and applied issues in biogeography. (Electronic 1997-)

*Check List* - an online journal of data on biodiversity featuring species lists and notes on distribution (<http://www.biotaxa.org/cl/index>)

*Diversity and Distributions* - applied biogeography with a conservation focus. (Electronic 1998-)

*Ecography* - a journal publishing many papers in biogeography. QH 540 H64. (Paper 1992-1996, electronic 2000- ).

*Global Ecology and Biogeography* - papers focusing on the emerging field of macroecology (Electronic 1998-)

*Global Ecology and Biogeography Letters* - short fast track publications in biogeography. QH 84 J86L. (Paper 1991-1995, electronic 1998-)

*Oikos* - an ecology journal that often publishes papers in biogeography. QH 540 O39. (Paper 1949, 1951-2004, electronic 2000-).

*American Naturalist* - an ecological journal that often publishes papers in biogeography. QH 1 A512. Current subscription (hardcopy 1968-, electronic 1997-).

Other ecological journals such as *Ecology*, *Ecology Letters*, *Oecologia*, *Journal of Animal Ecology*, and taxon specific journals such as *Journal of Mammalogy*, *Journal of Herpetology* also publish papers on biogeographical topics. Occasionally, papers on biogeography are also published scientific news journals such as *Science* and *Nature*.

**Other Texts:**

Brown, J.H., and A.C. Gibson. 1983. *Biogeography*. Mosby. QH 84 B76

Carlquist, S. 1974. *Island Biology*. A detailed account of the evolution of island forms of organisms. QH 541.5 I8C37.

Cox, C.B., and P.D. Moore. 2000. *Biogeography: an ecological and evolutionary approach*. 6<sup>th</sup> edition. Blackwell. ISBN 0-86542-778-X. This is the most widely used biogeography text and a good alternative text (although less detailed) to Brown and Lomolino. QH 84 C65 (older edition).

Darwin, C. 1859. *The origin of species*. Many printings available. All biology students, if not everyone, should read this scientific classic which had tremendous impact on how the world is viewed. QH 365 O2 or PN 6013 H33 v.11 or online <<http://www.literature.org/authors/darwin-charles/>>

Hengeveld, R. 1990. *Dynamic biogeography*. A perspective on biogeography that emphasizes the dynamics of distribution. Cambridge. QH 84 H46

Hubbell, S.P. 2001. *The unified neutral theory of biodiversity and biogeography*. Princeton ISBN 0 691 02128 7. A new mathematical theory building on MacArthur and Wilson's model of island biogeography that attempts to merge major concepts in ecology and biogeography. QH 541.15

B56H83

- Kolbert, E. 2014. *The Sixth Mass Extinction: An Unnatural History*. Henry Holt and Company, New York. A current popular science best seller describing the current extinction crisis. ISBN: 978-0-8050-9299-8.
- Lomolino, M.V., and J.H. Brown. 1998. *Biogeography*, 2<sup>nd</sup> ed. Sinauer ISBN 0 87893 073 6. A previous edition of our textbook .
- Lomolino, M.V., B.R. Riddle, and J.H. Brown. 2006. *Biogeography*, 3<sup>rd</sup> ed. Sinauer ISBN 0-87893-062-0. A previous edition of our textbook.
- Lomolino, M.V., B.R. Riddle, and J.H. Brown. 2010. *Biogeography*, 4<sup>th</sup> ed. Sinauer ISBN 0-87893-062-0. The penultimate edition of our textbook .
- Lomolino, M.V. and L.R. Heaney 2004. *Frontiers of Biogeography: New directions in the Geography of Nature*, Sinauer. An edited volume on emerging concepts in the field of biogeography.
- MacArthur, R.H., and E.O. Wilson. 1967. *The theory of island biogeography*. Monographs in Population Biology No. 1. Princeton. A detailed description of the equilibrium model of island biogeography which created a revolution in the field of biogeography. QH 85 M12
- Pielou, E.C. 1979. *Biogeography*. John Wiley. An older and more mathematical treatment of topics in biogeography. QH 84 P53
- Spellerberg, I.F., and J.W.D. Sawyer. 1999. *An introduction to applied biogeography*. A concise treatment of biogeography from an applied perspective. QH 84 S7
- Wallace, A.R. 1880. *Island life*. The summary of a life's work studying the distribution of island forms by the 'father of biogeography.' QH 85 .W18
- Whittaker, R.J. 1998. *Island biogeography: ecology, evolution, and conservation*. Oxford. A detailed treatment of the topic of island biogeography. QH 541.5 I8W48

**General books:**

- Crosby, A.W. 1986. *Ecological imperialism: the biological expansion of Europe, 900 - 1900*. Cambridge. An informative account of how Europeans facilitated species invasions. GF 50 C76
- Dale, V.H., F.J. Swanson, and C.M. Crisafulli. 2005. *Ecological responses to the 1980 eruption of Mount St. Helens*. Springer. ISBN 0 387 23850 6. An edited volume that examines the return of life after the volcanic eruption.
- Diamond, J.M. 1997. *Guns, germs and steel: the fates of human societies*. A Pulitzer prize winning book explaining the distribution of humans, development of civilization, and the disparate success of human societies from a geographical perspective. Norton. ISBN: 0-393-31755-2. HM 206 D48.
- Diamond, J.M. 2005. *Collapse: how societies choose to fail or succeed*. An examination of the environmental causes of collapse of civilizations. Penguin, New York. ISBN:0-670-03337-5. HN 13 D5 2005.
- Erwin, D.H. 2006. *Extinction: how life on earth nearly ended 250 million years ago*. A book analyzing the evidence for the causes of the greatest mass extinction (Permian) in Earth's history. Princeton University Press, Princeton. ISBN: 978-0-691-13628-8. QE 721.2 E97E965 2006.
- Flannery, T. 2001. *The eternal frontier: an ecological history of North America and its peoples*. Grove Press, NY. ISBN 0 8021 3888 8. An interesting account of the physical development of North America and the evolution and history of its biota with emphasis on mammals.
- Flannery, T. 2010. *Here on Earth: A Natural History of the Planet*. Atlantic Monthly Press, New York. ISBN: 978-0-8021-1976-6. A highly readable concise summary that interweaves many of the major concepts of ecology, evolution, biogeography and human history.
- Homer-Dixon, T. 2006. *The Upside of Down: Catastrophe, Creativity and the Renewal of Civilization*.

Vintage Canada ISBN: 978-0676977233

- Huxley, R. (Ed). 2007. *The Great Naturalists*. Thames & Hudson. London. ISBN: 978-0-500-251-39-3. This book covers how our understanding of natural history developed by examining the lives and contributions of 39 naturalists from ancient times to the 19<sup>th</sup> century.
- Jackson, M.H. 1993. *Galápagos: a natural history*. Univ. of Calgary Press. A highly readable book on the patterns of nature on the islands that inspired Darwin to develop his theory of natural selection. ISBN 1 895176 40 9
- Kolbert, E. 2014. *The Sixth Mass Extinction: an unnatural history*. Henry Holt. ISBN: 978-0-8050-9299-8. A popular account of how human actions are leading to the sixth mass extinction.
- Mayr, E., and J.M. Diamond. 2001. *The birds of northern Melanesia: speciation, ecology, and biogeography*. Oxford. ISBN 019 514170. QL 691 B52M38 2001.
- McCalman, I. 2009. *Darwin's armada: four voyages and the battle for the theory of evolution*. Norton, New York. ISBN: 978-0-393-06814-6. An account of how Darwin, Wallace, Hooker, and Huxley came to understand variation in nature, natural selection, and the defence and acceptance of the theory of evolution.
- Quammen, D. 1996. *The song of the dodo: island biogeography in an age of extinctions*. Touchstone. ISBN 0-684-82712-3. This popular book provides an entertaining read covering the development of the field and its contemporary importance.
- Ponting, C. 2007. *A new green history of the world: the environment and the collapse of great civilizations*. Penguin Books, London. ISBN: 978-0-14-303898-6. An environmentally based explanation of human history. GF 75 P66 2007 Orillia
- Raup, D.M. 1991. *Extinction: bad genes or bad luck*. Norton. ISBN 0-393-30927-4. An interesting book on mass extinctions.
- Rosenzweig, M.L. 1995. *Species diversity in space and time*. Cambridge. ISBN 0-521-499552-6. A very thorough treatment of the species-area effect and an argument that area is the primary cause of the latitudinal gradient in species richness.
- Stott, R. 2012. *Darwin's Ghosts*. Spiegel & Grau. ISBN: 978-1400069378. A very readable account chronicling the stories of Darwin's predecessors who influenced him in developing the theory of evolution by natural selection.
- Thompson, K. 2014. *Where Do Camels Belong?: Why Invasive Species Aren't All Bad*. Greystone, Vancouver. ISBN 978-1-77164-096-1. A book that questions native versus alien species and the importance of invasiveness as a fundamental concept.
- Thornton, I. 1996. *Krakatau: the destruction and reassembly of an island ecosystem*. ISBN 0-674-50572-7. A fascinating account chronicling the recovery of life on perhaps the world's most watched island.
- Ward, P.D. 1992. *On Methuselah's Trail: living fossils and the great extinctions*. W.H. Freeman, New York. 9780716722038. The author investigates the phenomenon of a number of 'living fossils' that provide glimpses into ancient times and past mass extinctions.
- Wilson, E.O. 1992. *The diversity of life*. Belknap ISBN 0-674-21298-3. A popular account of biological diversity and a plea for its conservation by one of the most influential living ecologist/biogeographers
- Winchester, S. 2001. *The map that changed the world: William Smith and the birth of modern geology*. Harper Perennial. ISBN 978-0-06-176790-6. A biography of William Smith whose work defining stratification of rocks and use of fossils for dating helped in establishing the age of the Earth. Also provides a good social history of science in the 18<sup>th</sup> and 19<sup>th</sup> century.
- Wright, R. 2006. *An illustrated short history of progress*. Anansi, Toronto. An environmental

interpretation of human history and assessment of the current sustainability of civilization. ISBN: 13-978-0-88784-206-1. CB 69 W75 2006, Audio of Massey Lectures CD 303.44 W75 2004 (Education Library).

### **Literature Searches:**

The library subscribes to two databases, *Web of Science* and *Biological Abstracts* that cover journals carrying articles on biogeography. *Web of Science* provides information (including abstracts) on articles published since 1998 and is updated weekly. *Biological Abstracts* provides similar information but permits searching back a number of years. Information on how to access these databases can be obtained from the reference desk in the Paterson Library. Searching Google Scholar online will also retrieve similar information and often links to available pdfs of papers. The Patterson library also has access to many primary journals where students can download journal papers for their own reading.

**Reserve Materials:** A folder containing course information and supplemental materials (e.g. practice problems, related readings) may be kept in the library at the circulation desk under the instructor's name and course number. The library may also have copies of some past final examinations which were provided by the university (not by the instructor). These can be helpful to some students as examples of the types of questions you may be asked in examinations. However, keep in mind that courses evolve and questions change. The instructor will not provide answers to questions from previous examinations held in the library.

### **Tentative Schedule of Lecture Topics**

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1. Introduction to biogeography (Chap. 1 in the text)
2. Historical development (Chap. 2)
3. Physical setting (Chap. 3)
4. Distributions of species (Chap. 4)
5. Distributions of communities and biomes (Chap. 5)
6. Dispersal (Chap. 6)
7. Speciation (Chap. 7)
8. Extinction (Chap. 7)
9. Dynamic earth (Chap. 8)
10. Glaciation (Chap. 9)

#### **Study week**

#### **Midterm – Tuesday February 28<sup>th</sup>**

11. Endemism, provincialism & disjunction (Chap. 10)
12. History of lineages (Chap. 11)
13. Reconstructing histories (Chap. 12)
14. Island biogeography - species richness (Chap. 13)
15. Island biogeography - assembly & evolution of communities (Chap. 13)
16. Areography, Ecogeography & Macroecology of Continents & Oceans (Chap. 14)
17. Human biogeography (Chap. 15)
18. Biodiversity (Chap. 15)
19. Habitat Loss and Fragmentation (Chap. 15)
20. Climate change (Chap. 15)
21. Species invasions (Chap. 16) (video, time permitting)

22. The future of biogeography (Chap. 16)

**Workbook and journal article assignment due – Thursday March 30, 2017**

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