

Fall 2019

GEOG 323: Biogeography

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Office Hours: T 12:00-2:00pm, W 10:00am – 12:00pm or by appointment

Lecture: T,R 2:00pm – 3:20pm, 140 Tykeson Hall

GTFs:

Dakota Whitman

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Office hours and location: Pacific 217A, times TBD

Weekly lab sections:

T 11am-11:50am, 106 Condon

T 12:00pm-12:50pm 106 Condon

M 2:00pm -2:50pm 330 Condon

W 2:00pm-2:50pm 193 ANS (9/30-10/25; 11/04-12/08), 191 ANS (10/28-11/01)

Course overview: Why are National Parks and reserves located where they are? Why are there more species of animals in the tropics than at the poles? Are we living during the sixth mass extinction event in Earth's history? Why are there elephants in Africa and Asia, but not in Europe or North America? These are all questions that can be answered with Biogeography. Biogeography is the study of the spatial patterns of biological diversity and its causes, from the beginning of life until now. Biogeographers synthesize information from many fields, including ecology, evolution, geology, paleontology, and climatology. This course will provide the ecological, environmental and historical foundations for the distribution and abundance of species and how they have changed through time. We will also explore the relevance of biogeography during a time of increasing human impact and climate change.

The course will roughly follow the material presented in the textbook, *Biogeography: An Ecological and Evolutionary Approach* (9th Ed.). We will begin with a history of the field of Biogeography and how evolutionary thinking is intimately tied to the field. We will then discuss important concepts, including evolutionary mechanisms, earth history, and plate tectonics, as well as concepts of the ecological niche and patterns of distribution at various taxonomic levels. We will also study ecological concepts, how species are patterned and disperse on the landscape,

and how these patterns have changed over recent time (e.g, the Quaternary). In the second part of the course, we delve into historical biogeography and study why continents and islands have unique assemblages of species, and the effects of megaextinctions, and biotic interchanges between continents. We will also return to ecological concepts in a detailed examination of the equilibrium theory of island biogeography. We will end with looking at modern biodiversity and ecological crises, and how biogeographical knowledge can inform critical modern environmental issues, such as species collapse, conservation, human-wildlife interactions and climate change.

Prerequisite: GEOG 141 or GEOL 103 or GEOL 203 or BI 370.

Course objectives:

- To develop an appreciation for the historical and ecological factors that influence the patterns of life on earth.
- To survey the scientific revolutions of evolution, plate tectonics, and molecular ecology that shaped the path to modern biogeography.
- Using the lab assignments, to understand the scientific method and how to test hypotheses using inferential statistics.
- To understand the processes that affect how biotas respond to a changing climate, and the challenges we face today and in years to come.

Course grading:

The final grade scale is as follows: A+: >98; A: 92-98; A-: 90-92; B+: 88-90; B: 82-88; B-: 80-82; C+: 78-80; C: 72-78; C-: 70-72%; D+: 68-70; D: 62-68; D-: 60-62; F: <60. I may occasionally offer extra credit, but there are no guarantees. Grades will be updated on Canvas, which is also where course announcements will be posted. You may make an appointment with me to discuss your grade(s) and progress in class.

Attendance: Attendance is not mandatory for this class. However, there will be periodic in-class activities that will be turned in for credit, accounting for 10% of your grade.

Exams: There will be two exams, each covering about 1/2 of the course and each worth 20% of your total grade.

Lab Reports: There will be five lab reports for a total of 50% of your grade. Weighting of the grades will increase with expectations and complexity of the lab:

- Lab 1: Trees, adaptations across the continents: 5%
- Lab 2: Virtual Megatransect: 10%
- Lab 3: Spatial patterns of individuals: 15%
- Lab 4: Island biogeography: 15%
- Lab 5: Invasive species: 5%. Lab 5 will be graded as credit/no credit: ALL questions must be answered to get credit!

Contacting me

I am available via email or phone. You are welcome to email me questions up until 12am the night before an exam.

Ethics

There is no talking permitted in class except during group in-class activities. Questions are welcomed and encouraged during class.

You may use a device such as a laptop or tablet in class, but you are NOT permitted to use your devices for anything other than reading course materials or note-taking. Second or additional infringements on use of digital devices for non-course related work will result in point reductions on exams (up to 10 points). If digital devices become a distraction, I reserve the right to ban them from lecture. I will note that many studies show that handwritten notes are better than typed notes for memory and retention. Students are not permitted to use their phones during class.

Academic misconduct, such as cheating, dishonesty and plagiarism will not be tolerated. All cases of academic dishonesty and/or misconduct will be referred immediately to the office of the Dean of Students. The penalties for engaging in academic dishonesty and/or misconduct can range from a grade of “F” for an assignment to an automatic failure of the course, to expulsion in extreme cases. Please consult the university policy at <https://dos.uoregon.edu/social-misconduct>.

Accessible Education

It is important to me that everyone has equal opportunity to excel in this course. If you need any specific accommodations in order to participate fully, please inform me of your particular needs, along with documentation from the Accessible Education Center. If accommodations need to be made for exams or lectures, you must inform me at least 1 week prior to the scheduled exam or lab period, after establishing accommodations with an AEC advisor. Please see the Accessible Education Center (www.aec.uoregon.edu) for specific guidelines.

Course Schedule

Week	Date	Topic	Readings
1	Oct 1	Introduction, syllabus and history of biogeography	Chapter 1
	Oct 3	Evolution and plate tectonics	Chapters 5, 6
	Lab 1	<i>Trees: adaptations across the continents I</i>	Meet at Condon east steps (facing the quad)
2	Oct 8	Introduction to dispersal: Excerpt from Darwin’s ‘Origin of Species’	Chapter 2, Darwin Ch. 12
	Oct 10	The ecological niche, distributions of species	Chapter 2
	Lab 1	<i>Trees: adaptations across the continents II</i>	
3	Oct 15	Ecoregions and biomes	Chapter 3
	Oct 17	Dispersal syndromes, barriers and limits to distributions	Chapter 8
	Lab 2	<i>The Virtual MegaTransect</i> Tree lab due at lab time on week 3	Meet at lab

4	Oct 22	Patterns of biodiversity: local gradients to global biodiversity hotspots.	Chapter 4
	Oct 24	Ice Ages and paleoclimate	Chapter 12
	Lab 2	<i>The Virtual MegaTransect</i> MegaTransect lab due Friday @ 5pm.	
5	Oct 29	Exam review, catch up and discussion	
	Oct 31	Midterm exam Exam will cover lecture, labs and readings weeks 1-4	
	Lab 3	<i>Spatial patterns of individuals - data collection</i>	Meet at Autzen footbridge
6	Nov 5	Vicariance biogeography, mammals and paleontology	Chapter 10
	Nov 7	Life, death and evolution on islands	Chapter 7
	Lab 3	<i>Spatial patterns of individuals – data analysis</i>	
7	Nov 12	The Theory of Island Biogeography	Chapter 7, Whittaker et al. 2017
	Nov 14	Island Biogeography: General Dynamic Model, Nestedness, SLOSS	Chapter 7
	Lab 4	<i>Island biogeography – data collection</i> Spatial patterns lab due at lab time on week 7	Meet at lab, then outside
8	Nov 19	Phylogenetics, vicariance biogeography and <i>Nothofagus</i>	Chapter 8
	Nov 21	Case studies in historical biogeography	TBD
	Lab 4	<i>Island biogeography – data analysis</i>	
9	Nov 26	The Great American Interchange and Amazonian biodiversity	McCarthy Ch. 5
	Nov 28	Thanksgiving – no class	
	Lab 5	<i>No meeting at lab time</i> <i>Island Biogeography lab due Wednesday at 5pm</i>	
10	Dec 3	Pleistocene megafaunal extinctions	Chapter 13
	Dec 5	Conservation Biogeography: Mega-extinctions, climate change, and environmental degradation	Chapter 14
	Lab 5	<i>Invasive species in-class reports</i>	
	Dec 11 12:30pm	Final Exam, location TBD Exam will cover lecture, labs and readings weeks 5-10	

Laboratories:

The five laboratory topics roughly correspond with current lecture topics. Most labs involve two meetings and involve the collection and interpretation of data.

The tree adaptations lab involves two walks around campus to observe traits of several tree species from throughout the world. You are to create inventive hypotheses regarding the adaptive role of differences in related tree species.

The virtual mega-transect lab meets during only one week and involves more independent work. This involves comparing vegetation structure with climate variables across continental transects (using online resources).

The spatial patterns lab addresses the distribution of individuals of a population, and is meant to demonstrate how certain processes leads to spatial patterns. It also involves use of a statistical test to test hypotheses.

The island biogeography lab uses a simulation of the processes that lead to species richness on an island. Data collected during the first week are analyzed during the second week.

The invasive species lab will consist of a film from Oregon Public Television. Meeting on week 10 involves short presentations of a particular invasive species. The assignment will involve extra reading and thinking about invasive species.

Each lab will culminate in a lab report in which you are to answer specific questions. While it is helpful to discuss the labs amongst each other, and many labs are performed in groups, the lab reports are to be completed individually. Note the due dates for lab reports on the syllabus: lab reports are due at the lab meeting time. For each day late, grades will decrease by 20% of the total possible lab grade.

Read the lab before each lab meeting.