Course: Biogeography
ESPM C125/GEOG C148/IB C166
Fall 2021

Background

The goals of the course are to (a) examine how geographically-linked characteristics of populations and species influence their potential for evolution and extinction; and (b) provide an overview of the approaches for studying the interplay between geographic ranges, environment, evolution, and extinction. In general, lectures will focus on teaching key biogeographic principles and the relevance of biogeography in forecasting global change. Lab sections will focus more on case studies and controversies.

Instructors: Rosemary Gillespie, Jeff Chambers; GSIs Maria Pettis, Kathy Nagel

Time and Place:

Lecture –T/TR 9:30am-11am
Lab – F 12 noon – 3pm or 3pm – 6pm
Prerequisites: Bio 1B or similar

Brief Description: 4 units. Three hours of lecture and three hours of lab per week. Explores how biogeographic processes influence the ecology and evolution of species, communities, and ecosystems. Provides insights into the effects of global change on biota.

Instructors: Rosemary Gillespie gillespie@berkeley.edu Office hours: TBA
Jeff Chambers jqchambers@berkeley.edu Office hours: TBA
Maria Pettis maria_pettis@berkeley.edu GSI. Office hours: By appointment
Kathy Nagel knagel@berkeley.edu GSI. Office hours: By appointment

Textbook: ***Preferred***: Biogeography, Fifth Edition, Mark V. Lomolino, Brett R. Riddle, and Robert J. Whittaker, Sinauer Associates. ***Low cost option***: Biogeography, Fourth Edition, Mark V. Lomolino, Brett R. Riddle, Robert J. Whittaker, James H. Brown, Sinauer Associates

GRADING:

Midterm: **20%** Open book, open notes. Short answer questions. Via bCourses. This will include all material from lectures, including the discussion topics.

Final: **30%** Same format as midterm, covering material from throughout the semester.

Lab: **40%** Each lab will culminate in a lab report or one page essay in which students are to answer specific questions. During lab students will work together on assignments or debate discussion prompts in the same pre-assigned small groups throughout the semester. Discussion prompts will also be used to evaluate student participation and understanding.

Participation: **10%** Students will participate in lecture discussions with a 20 minute group "discussion time" (~5 students each in 7 groups randomly assigned); for some discussions, there will be additional material to read that bears on the topic. At the end of the week, each student will submit a brief outline based on lecture discussions (via Assignments on bCourses) (a paragraph of ~100-150 words) of your perspective on the points raised, or results from your further explorations on the topics. These outlines should reflect the discussion and participation (rather than answers that are correct or incorrect), and will be graded as such.

. Syllabus

Week/ dates		
1: Aug 23-27	Aug 24: NO CLASS Aug 26: **Chapter 1. The Science of Biogeography** Discussion assignment: How do you determine the value of a species? Aug 27: ***No Lab***	**JC**
2: Aug29-Sep3	Aug 30: **Chapter 2. The History and Reticulating Phylogeny of Biogeography- We go through the European colonial influences on biogeography** Discussion assignment: What is (western) science? What is "indigenous science"? See https://www.esf.edu/indigenous-science-letter/ and read a few sections from Wilder et al 2016, The importance of indigenous knowledge in curbing the loss of language and biodiversity. BioScience, 66,499-509. Sept 2: **Chapter 2. The History and Reticulating Phylogeny of Biogeography - Start with the foundation of modern biogeography** Discussion assignment: Given that biogeography involves finding commonalities across regions, is there a way to incorporate placed-based indigenous science? How? OR: How does indigenous science differ from citizen science? What are the differences and commonalities? Sept 3: ***LAB:*** iNaturalist - Data collecting, sampling protocols, GPS, GBIF.	**RG**
3: Sep6-10	Sep 7: **Chapter 3. The Geographic Template 2: Visualization and Analysis of Biogeographic Patterns** Discussion assignment: Which state variable factor(s) is/are the primary determinant(s) of vegetation patterns northern coastal California: Sep 9: **Chapter 3. The Geographic Template 2: Visualization and Analysis of Biogeographic Patterns** Discussion assignment: Ecosystem development over time and remote sensing Sep 10: ***LAB*** – Discussion & take home essay	**JC**
4: Sep13-17	Sep 14: **Chapter 4. Distributions of Species: Ecological Foundations - How do we look at species ranges** Discussion assignment: Mapping and examining ranges of organisms Sep 16: **Chapter 4. Distributions of Species: Ecological Foundations - Interactions affecting distributions** Discussion assignment: Looking at databases that focus explicitly on interactions - different kinds of databases (GLOBI, kbase, EASIN, etc) Sep 17: ***LAB:*** Jupyter notebooks I. Databasing, digitization.	**RG**
5: Sep20-24	Sep 21: **Chapter 5. The Distribution and Dynamics of Communities, Biomes, and Ecosystems** Discussion assignment: Succession and global change Sep 23: **Chapter 5. The Distribution and Dynamics of Communities, Biomes, and Ecosystems** Discussion assignment: Global biome patterns and mechanisms Sep 24: ***LAB***: Remote sensing	**JC**
6: Sep27-Oct1	Sep 28: **Chapter 6. Dispersal and Immigration - Vicariance vs dispersal** Discussion assignment: Why is (or was) the debate between vicariance and dispersal so fraught? Sep 30: **Chapter 6. Dispersal and Immigration - Dispersal attributes** Discussion assignment: You will be randomly assigned a species that colonized Hawaii. Based on its characteristics, from what direction do you think it colonized? Oct 1: ***LAB*** Dispersal, colonization; sticky traps	**RG**
7: Oct 4-8	Oct 5: **Chapter 7. Speciation and Extinction- Population divergence and speciation** Discussion assignment: Genetic drift experiment using M&Ms? Oct 7: **Chapter 7. Speciation and Extinction - Adaptive radiation and extinction** Discussion assignment: Consider why mammal extinctions over the last 8-15k years have been (1) almost absent in Hawaii; (2) very high in Australia; (3) very high in N America; and (4) relatively low in Africa Oct 8: ***LAB***: Jupyter notebooks II. Genomics	**RG**

8: Oct 11-15	Oct 12: **Chapter 8. The Changing Earth** Discussion assignment: State factors of ecosystem development in Hawaii Oct 14: **Chapter 8. The Changing Earth** Discussion assignment: The effect of time on ecosystem development and biogeographical processes Oct 15: ***LAB***: Jupyter notebooks III. Mapping. **MIDTERM ASSIGNED THIS WEEK (online, during 3-hour window)**	**JC**
9: Oct 18-22	Oct 19: **Chapter 9. Glaciation and Biogeographic Dynamics of the Pleistocene** Discussion assignment: Adaptations selected for during the colder climates Oct 21: **Chapter 9. Glaciation and Biogeographic Dynamics of the Pleistocene** Discussion assignment: Biogeography of gymnosperms and angiosperms Oct 22: ***LAB*** **– Discussion & take home essay**	**JC**
10: Oct 25-29	Oct 26: **Chapter 10. The Geography of Diversification and Regionalization- Endemism, cosmopolitanism** Discussion assignment: Discussion of paleoendemics & neoendemics Oct 28: **Chapter 10. The Geography of Diversification and Regionalization - Provincialism, biogeographic lines** Discussion assignment: Discussion of convergence Oct 29: ***LAB*** Botanical Garden	**RG**
11: Nov 1-5	Nov 2: **Chapter 14. Areography, Ecogeography, and Macroecology of Continental and Oceanic Biotas** Discussion assignment: Why such high tropical forest plant diversity? Nov 4: **Chapter 14. Areography, Ecogeography, and Macroecology of Continental and Oceanic Biotas** Discussion assignment: Biogeography of photosynthetic strategies Nov 5: ***LAB:*** Palynology	**JC**
12: Nov 8-12	Nov 9: **Chapter 11. Reconstructing the Evolutionary History of Lineages** Discussion assignment: Exercise to generate a phylogeny Nov 11: **HOLIDAY** Nov 12: ***LAB***: Biogeobears, ancestral range reconstruction	**RG**
13: Nov 15-19	Nov 16: **Chapter 12. Reconstructing the Geographic History of Lineages & Biotas- Phylogeography, reconstructing geography** Discussion assignment: Students will receive a diagram of a phylogeographic reconstruction; they will be asked to interpret it and report back Nov 18: **Chapter 13. Island Biogeography- Equilibrium theory** Discussion assignment: Choose an island and think what might be the expectations in terms of the ETIB Nov 19: ***LAB***: Island biogeography.	**RG**
14: Nov 22-26	Nov 23: **Chapter 13. Island Biogeography- Ecology of evolution, adaptive diversification** Discussion assignment: What is the relative importance of invasion and climate change in affecting biodiversity, and how might this depend on where you are in the world? Nov 25: THANKSGIVING Nov 26: ***NO LAB***	**RG**
15: Nov29-Dec3	Nov 30: **Chapter 15. Biogeography of Humanity, Biological Diversity, and Conservation Biogeography** Discussion assignment: Human biogeography discussion Dec 2: **Chapter 15. Biogeography of Humanity, Biological Diversity, and Conservation Biogeography** Discussion assignment: biodiversity crisis discussion Dec 3: ***LAB*** **– Discussion & take home essay**	**JC**
16: Dec7-12	RRR week	
15:Dec	**FINALS WEEK**	