Course Description

Biogeography deals with spatial and temporal patterns of biological diversity and the factors that govern the distribution and abundance of taxa. This course will address two of its subfields: historical biogeography — the origin, dispersal, and extinction of taxa and biotas; and ecological biogeography — the role physical and biotic environments play in determining taxonomic distributions. We will explore the ecological, evolutionary, climatological, and paleontological foundations for the distribution of species and biological communities. The course will review many of the field’s classic papers, the current synthesis of biogeographic theory, and the application of biogeography to conservation.

Course Goals

By the end of the semester, you will be able to:

- Describe the historical and ecological factors which influence the pattern of life on earth
- Explain how advances in paleontology, climatology, evolution, plate tectonics, molecular systematics, and ecology have shaped the modern synthesis of biogeography
- Apply the scientific method and philosophy of hypothesis testing to biogeographic problems
- Evaluate modern conservation and mitigation strategies using biogeographic theory

A second set of goals relate to your development as a successful life-long learner; these include developing the abilities to:

- Evaluate your own knowledge and skills
- Analyze and interpret the primary scientific literature
- Communicate scientific arguments through written and oral work
- Work collaboratively

Prerequisites

This course is intended for juniors, seniors, and graduate students with prior coursework in biology. Enrollment is restricted to students who have taken IB 150 (Organismal & Evolutionary Biology) or have completed equivalent coursework. Additional coursework in Ecology (IB 203), Evolution (IB 302), and Genetics (IB 204) or their equivalents is strongly recommended. Students without this preparation should anticipate devoting additional time each week to independently reviewing fundamental concepts to keep up with the reading and assignments.
Instructor

Dr. Surangi W. Punyasena
Associate Professor, Plant Biology; Affiliate: Geology; Geography; Illinois Informatics Institute
Email: spunya1@illinois.edu
Office and hours: Zoom office hours, by appointment

Course Website and Communication

Course assignments, readings, the current syllabus, and Zoom links for online participation are posted on the Learn@Illinois site:  https://learn.illinois.edu/course/view.php?id=64422

You will need your NetID and password to gain access. Updates to the course will be announced in lecture and as announcements on Learn@Illinois. Please contact me if you have any problems accessing the website.

Official University e-mail addresses are used for course communications. Please note that you are expected to check your university issued e-mail account regularly and act on any communications received. Due to privacy restrictions, I may not be able to respond to e-mail messages sent from non-University e-mail accounts.

Course Structure

We meet twice a week for 80 minutes. Tuesdays are structured as a lecture and class discussion of the week’s topic. The anticipated lecture schedule is listed at the end of this document. PDFs of lecture slides will be available on the Learn@Illinois website the morning before class. All lectures will be live-streamed and recorded. Thursdays are structured around paper discussions. Attendance and participation in the Thursday discussion is graded. My hope is to provide a virtual option for all discussions as well. The final weeks of class will be student presentations.

Assigned Reading

Reading assignments serve two purposes. They provide context and background to the material covered in Tuesday lectures and they are the source of content for Thursday discussions. They will be listed on the Learn@Illinois course website.

Readings will be taken from peer-reviewed literature and our texts:

*Biogeography, Fifth Edition* (2017) [Required]
Mark V. Lomolino, Brett R. Riddle, and Robert J. Whittaker
Sinauer Associates
ISBN-10: 1605354724

*Foundations of Biogeography: Classic Papers with Commentaries* (2004) [Recommended]
MV Lomolino, DF Sax, and JH Brown (editors)
University Of Chicago Press
ISBN-10: 0226492370

The books are available for purchase at the university bookstore and are on reserve at Funk ACES Library. We use the Lomolino et al. textbook extensively in this class. The *Foundations* text is used for a limited number of assigned papers and in the final project. Sections of the book are also available online through Google Books.
The Learning Environment

Our classroom is an inclusive, collaborative environment for focused learning. A fundamental expectation is that you treat your classmates with respect. Disruptive behavior, including unauthorized use of phones and computers, is not permitted. You will be asked to use your laptop or a tablet for class assignments but will be asked to stop all non-lecture-related uses (social media, texting, web surfing, completing homework, etc.) Anyone violating this policy will first be given a warning, and then asked to leave class, forfeiting any credit for in-class assignments.

COVID Considerations

You are expected to follow all university guidelines on COVID safety, including face masks and vaccination/testing as required. Please wear a N95/KN95 mask for in-person attendance. Contact Dr. Punyasena if placed in quarantine or isolation to make alternative arrangements for instruction and assignment credit.

Online Pre-Lecture Assignments

These 11 weekly assignments are meant to help prepare you for the week’s lecture and discussion. They will include 5-10 short answer questions and must be completed by Monday 11:55 pm to receive credit.

Lecture Activities

We have a short weekly lecture response at the end of every lecture, where you will reflect on what you learned. This response must be turned in using the course website every Tuesday by 11:55 pm for extra credit. We may also occasionally have lecture activities designed to reinforce learning of a specific concept.

Thursday Discussions

Our Thursday classes focus on the reading of the primary scientific literature. Each week, you are responsible for an in-depth reading of 1 or 2 classic and contemporary journal articles. You will need to submit two discussion questions based on the week’s reading by Wednesday 11:55 pm. During class, you will be assigned to a discussion group. You will have 40 minutes to discuss the posted questions and to post your responses to a selected set of these questions as a group. Questions and responses will be graded for thoughtfulness and the degree to which they demonstrate close reading of the material. We will then discuss these responses as a class. Questions selected for discussion will receive extra credit. You will need to bring a laptop or an alternative device capable of connecting to the Learn@Illinois website. You may miss one discussion without penalty.

Midterm and Final Exams

There are two written exams. Both are in-person and closed book. The format is short essay. A list of potential exam questions will be distributed one week before each exam.

If COVID conditions warrant remote attendance, exams will be take-home and open book.
Final Project

The goal of the class is for you to demonstrate your literacy and depth of knowledge of biogeography. The final presentations are designed to evaluate the degree to which you have achieved this goal. If you have trouble getting started, please arrange to speak with me well in advance of the due dates!

Prospectus – Due February 10

The presentation prospectus will get you thinking about the final project early in the semester. The prospectus should be 3-5 pages double-spaced. In it you should:

- Choose a paper from *Foundations of Biogeography: Classic Papers with Commentaries* not covered in class
- Identify the major biogeographic themes identified by that paper
- List the complete citation for 5 or more recent peer-reviewed journal articles that help define where this biogeographic subfield is today
- Include context and explanation for these five papers

Presentation outline – Due March 10

The presentation outline is intended to demonstrate the progress you have made in developing a unified presentation of your ideas. It should be 3-5 pages double-spaced. If we have more than 33 students in the class, you may elect to work in pairs. In the outline, you should:

- Identify the *Foundations* paper that you will present
- List the biogeographic themes from the paper you will explore further
- Provide a bibliography of at least 5 recent peer-reviewed journal articles that you are reviewing for the presentation
- Outline the major arguments you will make in your presentation

You will receive feedback following spring break.

Class presentation – Due April 19-28

I have reserved the last three weeks of class for group presentations. Presentations should be 8 minutes in length with 2 minutes for questions. A copy of your bibliography should also be turned in online at this time. Presentations will be evaluated based on the following criteria:

- Thoroughness of the bibliographic research presented
- Originality of ideas
- Quality of the presentation and degree of preparation (slides and speech)
- Ability to answer questions from your peers
Grading and Assignment Values

Grading is on a 1000-point scale, with points distributed as follows:

- Midterm 140
- Final 150
- Pre-lecture assignments (11, @20 points each) 220
- Discussion questions (11, @15 points each, lowest dropped) 150
- Discussion responses (11, @10 points each, lowest dropped) 100
- Presentation prospectus 50
- Presentation outline 50
- Presentation 100
- Presentation feedback (15 points per day) 40
- Extra Credit: Lecture feedback submitted, 3 points per week 33
- Extra Credit: Discussion questions selected, 3 points per week 33

Letter grades will be assigned according to an absolute scale.

- A+ >970 points
- A 930-969 points
- A- 900-929 points
- B+ 870-899 points
- B 830-869 points
- B- 800-829 points
- C+ 770-799 points
- C 730-769 points
- C- 700-729 points
- D+ 670-699 points
- D 630-669 points
- D- 600-629 points
- F 0-599 points

Grade Disputes

Questions regarding grading should be raised within one week of the grades being uploaded to the Learn@Illinois gradebook. It is your responsibility to review your grades on a regular basis.

Late Assignments and Absences

Assignment deadlines are coordinated with in-class activities. Therefore, late assignments are only allowed in the case of excused absences. Pre-lecture activities may be turned in late only with instructor permission. Paper summaries will be requested in lieu of missed pre-discussion forum questions.

Request for Special Accommodations

Students requesting accommodations due to documented disabilities or religious observances should contact Dr. Punyasena within the first two weeks of class. Exams at alternate facilities should be arranged at a time within 24 hours of the regularly scheduled exam.
Academic Integrity

All students are assumed to have read and understood the University of Illinois Student Code, (https://studentcode.illinois.edu/) and will be expected to act accordingly. Please review the code carefully as it outlines your rights and responsibilities as a student at this university.

Course Copyright

The content of the syllabus, lectures, and other class materials (including multimedia) for this course is copyrighted. External material is used with permission from the original sources or under fair-use guidelines. All content is intended for the private use of students enrolled in IB 439 and its cross-listed rubrics and may not be reproduced without the written permission of Dr. Punyasena. This includes the uploading and sharing of course material on public or for-profit websites. Unauthorized distribution of copyrighted materials may violate federal law and/or the University of Illinois Student Code.
**Anticipated Lecture and Discussion Schedule**

Updates to the lecture, discussion, and exam schedules will be announced in lecture and as course announcements on Learn@Illinois.

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Date</th>
<th>Lecture Title</th>
<th>Assignment Details</th>
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| Week 1: What is Biogeography? | Tu 18-Jan | Lecture 1 | Species in space and time  
*Pre-lecture assignment due Mon 11:55 pm* |
| | Th 20-Jan | Paper Discussion | Fundamental patterns in biogeography: the latitudinal gradient  
*Pre-discussion assignment due Wed 11:55 pm* |
| Week 2: The Geographic Range | Tu 25-Jan | Lecture 2 | Physical and biotic controls of the species range  
*Pre-lecture assignment due Mon 11:55 pm* |
| | Th 27-Jan | Paper Discussion | Higher mountain passes  
*Pre-discussion assignment due Wed 11:55 pm* |
| Week 3: The Niche | Tu 01-Feb | Lecture 3 | Defining the niche  
*Pre-lecture assignment due Mon 11:55 pm* |
| | Th 03-Feb | Paper Discussion | The niche in space and time  
*Pre-discussion assignment due Wed 11:55 pm* |
| Week 4: Dispersal and Migration | Tu 08-Feb | Lecture 4 | Dispersal and migration  
*Pre-lecture assignment due Mon 11:55 pm* |
| | Th 10-Feb | Paper Discussion | Species “invasions”  
*Pre-discussion assignment due Wed 11:55 pm*  
**PRESENTATION PROSPECTUS DUE Thurs 11:55 pm** |
| Week 5: Evolution, Niche, and the Geographic Range | Tu 15-Feb | Lecture 5 | The geographic context of evolution  
*Pre-lecture assignment due Mon 11:55 pm* |
| | Th 17-Feb | Paper Discussion | Evolution, climate change, and species range  
*Pre-discussion assignment due Wed 11:55 pm* |
| Week 6: Vicariance versus Dispersal | Tu 22-Feb | Lecture 6 | The fundamental debate of historical biogeography  
*Pre-lecture assignment due Mon 11:55 pm* |
| | Th 24-Feb | Paper Discussion | Darwin’s rafts  
*Pre-discussion assignment due Wed 11:55 pm* |
| Week 7: Midterm Exam | Tu 01-Mar | | MIDTERM EXAM |
| | Th 03-Mar | Guest Lecture | Dr. Mark Lara, Plant Biology  
**Week 8: The Evolutionary Signature of Biogeographic History** |
| | Tu 08-Mar | Lecture 7 | Genetic reconstructions of migration and isolation (phylogeography)  
*Pre-lecture assignment due Mon 11:55 pm* |
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<th>Date</th>
<th>Activity</th>
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<tr>
<td>Th 10-Mar</td>
<td>Paper Discussion</td>
<td>Refugia past and present</td>
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<td><em>Pre-discussion assignment due Wed 11:55 pm</em></td>
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<td><em>PRESENTATION OUTLINE DUE Thursday 11:55 pm</em></td>
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<td>Week 9: Spring Break</td>
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<td>Tu 15-Mar</td>
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<td>No Classes</td>
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<td>Th 17-Mar</td>
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<td>Week 10: Extinction and the Geographic Range</td>
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<td>Tu 22-Mar</td>
<td>Lecture 8</td>
<td>Extinction shapes geographic range – geographic range shapes extinction</td>
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<td><em>Pre-lecture assignment due Mon 11:55 pm</em></td>
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<td>Th 24-Mar</td>
<td>Paper Discussion</td>
<td>Extinctions shape diversity</td>
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<td><em>Pre-discussion assignment due Wed 11:55 pm</em></td>
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<td>Week 11: The Biogeography of Islands</td>
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<td>Tu 29-Mar</td>
<td>Lecture 9</td>
<td>Islands and the balance of diversity</td>
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<td><em>Pre-lecture assignment due Mon 11:55 pm</em></td>
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<td>Th 31-Mar</td>
<td>Paper Discussion</td>
<td>Conservation and species-area</td>
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<td><em>Pre-discussion assignment due Wed 11:55 pm</em></td>
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<td>Week 12: Biomes and Communities</td>
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<td>Tu 05-Apr</td>
<td>Lecture 10</td>
<td>Community assembly (Clements, Gleason, and modern syntheses)</td>
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<td><em>Pre-lecture assignment due Mon 11:55 pm</em></td>
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<td>Th 07-Apr</td>
<td>Paper Discussion</td>
<td>The shifting community</td>
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<td><em>Pre-discussion assignment due Wed 11:55 pm</em></td>
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<td>Week 13: Conservation Biogeography</td>
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<td>Tu 12-Apr</td>
<td>Lecture 11</td>
<td>Land use and human impacts</td>
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<td><em>Pre-lecture assignment due Mon 11:55 pm</em></td>
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<td>Th 14-Apr</td>
<td>Paper Discussion</td>
<td>Interpreting environmental impacts</td>
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<td><em>Pre-discussion assignment due Wed 11:55 pm</em></td>
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<td>Week 14: Final presentations</td>
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<td>Tu 19-Apr</td>
<td>Presentations 1 - 8</td>
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<td>Th 21-Apr</td>
<td>Presentations 9 - 16</td>
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<td>Week 15: Final presentations</td>
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<td>Tu 26-Apr</td>
<td>Presentations 17 - 24</td>
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<td>Th 28-Apr</td>
<td>Presentations 25 - 32</td>
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<td>Week 16: Final exam</td>
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<td>Tu 03-May</td>
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<td>FINAL EXAM</td>
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