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 upper classmen and graduate students with an extensive background in biology and ecology. 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 learning these fundamental concepts to keep up with the reading and assignments.

Instructor

Dr. Surangi W. Punyasena
Assistant Professor, Plant Biology; Affiliate: Geology; Geography; Illinois Informatics Institute
Email: punyasena@life.illinois.edu
Office and hours: 139B Morrill Hall; Tuesdays 3.00 – 5.00 pm

Course Website and Communication

Course assignments, readings, and the current syllabus are posted on the Learn@Illinois site:

https://learn.illinois.edu/course/view.php?id=14471

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. Please use your official University email account to contact me. 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. You are expected to attend lecture; there are weekly in-class assignments that count toward your final grade. Thursdays are structured around paper discussions. Attendance and participation in the Thursday discussion is graded. The final week of class will entail group presentations based on a paper chosen from our Foundations text.

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 required texts:
These books are available for purchase at the university bookstore and will be on reserve at the Grainger Engineering 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 group presentation assignment. A portion of the book is also available online through Google Books.

**The Learning Environment**

Our classroom is an inclusive, collaborative environment for focused learning, where everyone is given a chance to succeed. A fundamental expectation is that you treat your classmates with respect. Disruptive behavior, including unauthorized use of phones and computers is prohibited. You are welcome to use your laptop or a tablet for note taking, but all non-lecture-related use (social media, texting, web surfing, completing homework, etc.) is prohibited. Anyone violating this policy will first be given a warning, and then be asked to leave class, forfeiting any credit for assignments due that day.

**Online Pre-Lecture Assignments**

These twelve weekly online quizzes are intended to ensure that you have completed the textbook readings and are prepared for the week’s lecture and discussion. They will include 5-10 short answer questions. These must be completed by Tuesday 9 am to receive credit. Each quiz is worth 15 points.

**Lecture Activities**

We will have a “5-minute paper” at the end every lecture, where you have the opportunity to demonstrate what you learned and ask questions. We may also occasionally have lecture activities designed to reinforce learning of a specific concept. These must be turned in for credit, 5 points per lecture, for maximum of 60 points, or 6% of your final grade. You may miss one lecture without penalty.

**Thursday Discussion**

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/or contemporary journal articles. By 9 am each Thursday, you will need to submit two discussion questions based on the reading to the week’s online forum. Please submit each question as a separate post. During class, you will randomly be assigned to a group of five. You will have 45 minutes to discuss the posted questions as a group, and
to post your responses to 5 or more of these questions (not your own!). 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 that stimulate the most thought-provoking discussion, based on the class responses and my evaluation, will receive extra credit (~2 points). 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.

Final Project
The ultimate goal of the class is for you to demonstrate your literacy and depth of knowledge of biogeography. The group 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 23
The presentation prospectus will get you thinking about the final project early in the semester. It will also allow me to assign you to a group with common interests. The prospectus should be 3-5 pages double-spaced. In it you should:

• Choose a paper from our text: Foundations of Biogeography: Classic Papers with Commentaries
• 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

Groups will be assigned in class on March 3. The size of the groups will depend on the final size of the class.

Presentation outline (group assignment) – Due March 17
The presentation outline is intended to demonstrate the progress your group has made in developing a unified presentation of your ideas. It should be 3-5 pages double-spaced. In it you should:

• Identify the Foundations paper that your group 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

Your group will receive feedback following spring break.
**Group presentation (group assignment) – Due April 26-28**

I have reserved the penultimate week of classes for group presentations. Presentations should be 8 minutes in length with 2 minutes for questions. A hard copy of your bibliography should also be turned in 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

Your final grade for the presentation will be determined in part by the evaluations of the members of your group. Members of the class will be asked to submit questions for each presentation.

**Grading**

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

- Midterm 150
- Final 150
- Pre-lecture assignments (13, @15 points each) 195
- Lecture activities 60
- Discussion questions (11, @10 points each) 110
- Discussion responses 100
- Presentation prospectus 50
- Presentation outline 50
- Presentation 90
- Presentation peer-evaluations 15
- Presentation feedback (15, @ 2 points each) 30
- Extra credit (discussion) 22

Letter grades will be assigned according to an absolute scale.

- A+ >980 points
- A 920-979 points
- A- 900-919 points
- B+ 880-899 points
- B 820-879 points
- B- 800-819 points
- C+ 780-799 points
- C 720-779 points
- C- 700-719 points
- D+ 680-699 points
- D 600-679 points
- F 0-599 points
Grade Disputes

Questions regarding grading should be raised within one week of the grades being uploaded to the Moodle gradebook. It is your responsibility to review your gradebook on a regular basis to check for errors.

Request for Special Accommodations

Students requesting accommodations due to documented disabilities or religious observances should contact me 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, (http://studentcode.illinois.edu/index.html) 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 / ESES 439 / GEOG 436 / ANTH 436 / NRES 441 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.
### Tentative Lecture and Discussion Schedule

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

**Week 1: What is Biogeography?**

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<tr>
<th>Date</th>
<th>Type</th>
<th>Topic</th>
<th>Assignment Due</th>
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<tbody>
<tr>
<td>Tu 19-Jan</td>
<td>Lecture 1</td>
<td>Species in space and time</td>
<td>Pre-lecture assignment due 9 am</td>
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<tr>
<td>Th 21-Jan</td>
<td>Paper Discussion</td>
<td>Fundamental patterns: the latitudinal gradient</td>
<td>Pre-discussion assignment due 9 am</td>
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<td>Foundations, Paper 3 – Forster (1778)</td>
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**Week 2: The Geographic Range**

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<th>Topic</th>
<th>Assignment Due</th>
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<tbody>
<tr>
<td>Tu 26-Jan</td>
<td>Lecture 2</td>
<td>Defining the species range</td>
<td>Pre-lecture assignment due 9 am</td>
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<tr>
<td>Th 28-Jan</td>
<td>Paper Discussion</td>
<td>Conceptualizing the range</td>
<td>Pre-discussion assignment due 9 am</td>
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**Week 3: The Niche**

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<th>Date</th>
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<th>Topic</th>
<th>Assignment Due</th>
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<tr>
<td>Tu 2-Feb</td>
<td>Lecture 3</td>
<td>Physical and biotic controls of the species range</td>
<td>Pre-lecture assignment due 9 am</td>
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<tr>
<td>Th 4-Feb</td>
<td>Paper Discussion</td>
<td>The niche in space and time</td>
<td>Pre-discussion assignment due 9 am</td>
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**Week 4: Migration and the Geographic Range**

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<th>Date</th>
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<th>Topic</th>
<th>Assignment Due</th>
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<tbody>
<tr>
<td>Tu 9-Feb</td>
<td>Lecture 4</td>
<td>Dispersal and migration</td>
<td>Pre-lecture assignment due 9 am</td>
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<tr>
<td>Th 11-Feb</td>
<td>Paper Discussion</td>
<td>Species “invasions”</td>
<td>Pre-discussion assignment due 9 am</td>
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<td><strong>Foundations, Paper 27 – Grinnell (1922)</strong></td>
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**Week 5: Extinction and the Geographic Range**

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<th>Date</th>
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<th>Topic</th>
<th>Assignment Due</th>
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<tr>
<td>Tu 16-Feb</td>
<td>Lecture 5</td>
<td>Extinction shapes geographic range/geographic range shapes</td>
<td>Pre-lecture assignment due 9 am</td>
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<td>Th 18-Feb</td>
<td>Paper Discussion</td>
<td>The Pleistocene extinctions</td>
<td>Pre-discussion assignment due 9 am</td>
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<td><strong>Foundations, Paper 35 – Martin (1973)</strong></td>
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<td>Week 6: Evolution and the Geographic Range</td>
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| **Tu 23-Feb** | Lecture 6 | Adaptation and the niche  
  *Pre-lecture assignment due 9 am*  
  **PRESENTATION PROSPECTUS DUE** |
| **Th 25-Feb** | Paper Discussion | Evolution, climate change, and species range  
  • **Davis and Shaw (2001). Science, 292(5517): 673-679**  
  *Pre-discussion assignment due 9 am* |

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<th>Week 7: Midterm Exam</th>
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<td><strong>Tu 1-Mar</strong></td>
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<th>Week 8: The Evolutionary Signature of Biogeographic History</th>
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| **Tu 8-Mar** | Lecture 7 | Genetic reconstructions of migration and isolation  
  (phylogeography)  
  *Pre-lecture assignment due 9 am* |
| **Th 10-Mar** | Paper Discussion | Ice Age refugia  
  • **Gavin et al (2014) New Phytologist, 204: 37-54**  
  *Pre-discussion assignment due 9 am* |

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<th>Week 9: Vicariance versus Dispersal</th>
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| **Tu 15-Mar** | Lecture 8 | The fundamental debate of historical biogeography  
  *Pre-lecture assignment due 9 am* |
| **Th 17-Mar** | Paper Discussion | Darwin’s rafts and duck feet  
  • Foundations, Paper 11 – Darwin (1859)  
  *Pre-discussion assignment due 9 am* |

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<th>Week 10: Spring Break</th>
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<td><strong>Tu 22-Mar</strong></td>
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<td><strong>Th 24-Mar</strong></td>
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<th>Week 11: The Biogeography of Islands</th>
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| **Tu 29-Mar** | Lecture 9 | Islands and the balance of diversity  
  *Pre-lecture assignment due 9 am* |
| **Th 31-Mar** | Paper Discussion | Conservation and species-area  
  • Foundations, Paper 52 – Arrhenius (1921)  
  *Pre-discussion assignment due 9 am* |

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<th>Week 12: Biomes and Communities</th>
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| **Tu 5-Apr** | Lecture 10 | Community assembly (Clements, Gleason, and modern syntheses)  
  *Pre-lecture assignment due 9 am* |
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<tr>
<th>Date</th>
<th>Session</th>
<th>Topic</th>
<th>Reading References</th>
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| Th 7-Apr   | Paper Discussion                     | The shifting community                                   | • **Gleason (1926).** Bulletin of the Torrey Botanical Club, 53(1): 7-26  
*Pre-discussion assignment due 9 am* |
| Week 13: Conservation Biogeography |                                      |                                                         |                                                                                                                                                   |
| Tu 12-Apr  | Lecture 11                           | Land use and human impacts                              | *Pre-lecture assignment due 9 am*                                                                                                                  |
*Pre-discussion assignment due 9 am* |
| Week 14: Applications of Biogeography |                                      |                                                         |                                                                                                                                                   |
| Tu 19-Apr  | Lecture 12                           | Guest Lecture: Jonathan Greenberg, Geography             | *Pre-lecture assignment due 9 am*                                                                                                                  |
| Th 21-Apr  | Lecture 13                           | Guest Lecture: Jennifer Fraterrigo, Natural Resources    | *Pre-discussion assignment due 9 am*                                                                                                                |
| Week 15: Group presentations |                                      |                                                         |                                                                                                                                                   |
| Tu 26-Apr  | Groups 1 - 8                         |                                                         |                                                                                                                                                   |
| Th 28-Apr  | Groups 9 - 16                        |                                                         |                                                                                                                                                   |
| Week 16: Final Exam |                                      |                                                         |                                                                                                                                                   |
| Tu 3-May   |                                      |                                                         | *IN-CLASS & CLOSED BOOK*                                                                                                                             |