BIOGEOGRAPHY
GEO 4300/5305 (Sect. 0173/6781); 6 January 2015

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Professor and Chair of Geography

Lecture 1: 6 January 2015

• Introduction – Biogeography?
  – The Science of Biogeography
    • Major questions
    • Methods
  – Why Geography instead of Biology?
• This Class – the Semester
  – Objectives
  – Logistics
  – Evaluation
  – Schedule including problems during next two weeks
• Reading: Chapter 1 & 2 in Lomolino et al.

Definition of Biogeography

• “Geography (geo, “Earth,” and graphein “to write”) is the science that studies the relationships among geographic areas, natural systems, society, cultural activities, and the interdependence of these over space.” R. Christopherson. 2008. Geosystems. p. 2
• Causes and Consequences of spatial heterogeneity of Earth’s surface.
• Themes of Geography: Location, Place, Flows, Human-Environment Interactions.

Definition of Biogeography

• Biogeography: Describe and explain spatial patterns of biological diversity.
  – Study of distributions of organisms, past and present (Lomolino et al. 2010. p 4)
  – “Biological Diversity” includes genes to communities, whole ecosystems, and biomes
  – “Spatial Patterns” includes geographic variation at all scales
  – “Earth” includes terrestrial and aquatic/marine systems.

Major Questions of Biogeography
- Scale: Extent of Study Area
Major Questions of Biogeography
- Scale: Grain of Study Area

Tools of locations measurement, e.g. Landsat vs. Quickbird; GPS

Question of Biogeography
- 10 Questions on P 5 Lomolino

Fundamental Question of Biogeography
- How and why does biological diversity vary over the surface of the Earth?

Fundamental Principles of Biogeography
1. First Principle of Biogeography: Environmentally similar but isolated regions have distinct assemblages of organisms (Buffon’s Law).
2. Fundamental Assumptions
   - Evolution by natural selection (Darwin, Wallace)
   - Uniformitarianism (Charles Lyell)

Persistent Themes in Biogeography
- Classifying geographic regions based on their biotas.
- Reconstructing the historical development of lineages and biotas, including their origin, spread, and diversification.
- Explaining differences of numbers and types of species among geographic areas and along geographic gradients (area, isolation, latitude, elevation, depth)
- Explaining geographic variation in the characteristics of individuals and populations of closely related species.

Several Approaches to Biogeography
- Historical Biogeography
  - Reconstructs the origin, dispersal, and extinction of taxa and biotas; Evolutionary Biogeography
- Paleocology
  - Investigates relationships between organisms and past environments – a bridge.
- Ecological Biogeography
  - Accounts for present distributions and geographic variation in diversity in terms of interactions between organisms and their physical and biotic environment.
- Evolutionary Biogeography
  - Uses distributional, phylogenetic, molecular, and fossil data to assess the historical changes that have produced current biotic patterns.
Macrosystems Biology – New NSF Program


NEON

http://www.neoninc.org/about-neon/overview.html

Course Objectives of the Class

1. Understand and explain current knowledge about the patterns and processes that determine the distribution of Earth’s biodiversity, and learn how to apply this knowledge to solving important problems.

2. Undergraduates:
   a) Learn the hypothetico-deductive scientific method: observations, theoretical explanation, testable hypotheses and their tests, theory modification. Educated Skepticism!
   b) Learn how to read, understand, and summarize the peer-reviewed scientific literature on Biogeography.

3. Graduates:
   a) Learn the journals and standards of Biogeographical research.
   b) Learn the classic literature in Biogeography and gain experience leading discussions of this literature

Who are you?

- Name
- Major (and thesis/dissertation topic for grad students)
- Expectations for this class
- Something surprising about yourself

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TEMPORARY UNTIL CANVAS SITE IS UP AND RUNNING!
Evaluation

Basis of Grade:

1. Two equally weighted essay examinations (midterm and end of semester), BOTH TAKE-HOME

2. Undergraduates (GEO 4300): Six one-page summaries of a peer-reviewed paper in the current scientific literature every other week weighted as one exam.

3. Graduate Students (GEO 5305): “Classic Paper” Discussions; Term paper (maximum 20 pages, 12-point font, including figures, tables, and references) on a biogeographic topic weighted as one exam.

Grading Scale

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Next Time 8 January – Two Lectures

- History of Biogeography
- Organization of Life
- Systematics and Biological Nomenclature
- Perhaps: The Environmental Setting