BISC 180Lxg: Evolution
4 units
Spring 2015

Course Description:

Evolution is the unifying principle of all biology but the importance of its study is not restricted to biologists. Understanding evolution is of paramount importance to comprehending the “why” and “how” of modern human variation and our species’ role in the biosphere. This course provides students from all disciplines with a background in evolution that will prepare them to think critically about a wide range of everyday issues including healthcare, culture, and society.

Learning Objectives:

This course will use a combination of lecture and laboratory meetings to provide students with a basic understanding of the scientific method and how it has been employed in the study of evolution. Lecture topics will range from principles of evolution and the history of scientific discovery to contemporary issues of human medicine and agriculture. Laboratories will take many forms, including experimental data collection and interpretation, field trips to local natural history collections, computer simulations of natural processes, and group discussions of current events and controversies. The course will be divided into three parts as follows, with the latter parts built upon the concepts introduced in the first part:

In the first part of the class (weeks 1-5), students will learn about the history of evolutionary theory and encounter evidence for evolution in examples of natural selection and a tour through the fossil record. By the end of this unit, students will have a broad understanding of how evolution accounts for the diversity of life on Earth. During this part of the class students will have the opportunity to observe ongoing adaption by bacteria in the laboratory and study evolution in the fossil record by visiting the Los Angeles County Museum of Natural History.

In the second part of the course (weeks 6-10), the focus will shift to human evolution. Students will learn about the evolutionary history and genetic bases underlying important aspects of human biological variation, including skin color, diet, and disease susceptibility. These topics will be paired with laboratory exercises that address the interpretation of the hominid fossil record and the acquisition of complex human behaviors.

In the third part of the class (weeks 11-15), students will explore the many ways in which the human race has modified its environment, both for better and for worse. The human practice of artificial selection will be illustrated by highlighting examples of the domestic animals and plants upon which our society is dependent. This part of the course will analyze the consequences of human practices in terms of disease and environmental contamination. In lab students will simulate the spread and containment of an emerging disease from an epidemiological perspective. Lab meetings will also be devoted to student presentations on the topic of communicating science to the public, reinforcing one of the main themes of the course: the value of understanding evolution for all individuals in all walks of life.
Lecture Time and Location:

MWF: 11:00-11:50 AM, ZHS 352

Laboratory Times and Location:

Th: 12:00 - 1:50 PM, 2:00 - 3:50 PM, ZHS 369
F: 12:00 - 1:50 PM, ZHS 369

Instructor: Dr. Oliver Rizk, orizk@usc.edu
AHF 107B

Office Hours: Mondays: 1:30-2:30 PM
Thursdays: 4-5 PM

Lab Manager: Gorjana Bezmalinovic, bezmalin@usc.edu
ZHS 362

Website: https://blackboard.usc.edu

Required Readings: There is no textbook required for this course. Instead, weekly reading assignments will be posted to the course website (see above) in digital form. Readings will draw from historical texts such as Charles Darwin’s *Origin of Species*, popular science essays by authors such as Stephen Jay Gould and Richard Dawkins, and scientific journal articles from a broad variety of disciplines.

There is also no required laboratory manual. Lab worksheets describing the lab topic and protocol for each meeting will be posted to the course website (see above) in advance for students to access in preparation for each activity.

Exams: The lecture portion of this course will include two midterm examinations and a final examination. All examinations (midterm and final) may include multiple choice questions, fill-in answer, short answers, short essays, definitions, and quantitative problems. The final examination will be cumulative but also weighted towards material covered in the final third of the course.
Schedule of Lecture Topics:

**Week 1**
- **M** 1/12  Introduction; Course Overview
- **W** 1/14  Preamble to Darwin: Concepts of Change Over Time
- **F** 1/16  The Contributions of Charles Darwin: Natural Selection

**Week 2**
- **M** 1/19  MLK Jr.’s Birthday Holiday -- NO CLASS
- **W** 1/21  Post-Darwinian Contributions: Genotype to Phenotype
- **F** 1/23  Natural Selection at Work I: Stickleback Fish

**Week 3**
- **M** 1/26  Natural Selection at Work II: The Vertebrate Dentition
- **W** 1/28  Natural Selection at Work III: Antibiotic Resistance
- **F** 1/30  Understanding the Fossil Record I: Geology and the History of the Earth

**Week 4**
- **M** 2/2  Understanding the Fossil Record II: Paleontology and Fossil Discovery
- **W** 2/4  Understanding the Fossil Record III: Transitional Species
- **F** 2/6  The Diversity of Life on Earth I: Prokaryote Evolution

**Week 5**
- **M** 2/9  The Diversity of Life on Earth II: Eukaryote Evolution and Endosymbiosis
- **W** 2/11  The Diversity of Life on Earth III: The Age of Mammals
- **F** 2/13  MIDTERM EXAM #1

**Part 2: Evolution of Human Biological Variation**

**Week 6**
- **M** 2/16  President’s Day Holiday -- NO CLASS
- **W** 2/18  Order Primates: Our Closest Relatives
- **F** 2/20  Paleoanthropology I: African Origins

**Week 7**
- **M** 2/23  Paleoanthropology II: Modern Human Origins
- **W** 2/25  Skin Color and Vitamin D
- **F** 2/27  Human Diet I: Omnivory

**Week 8**
- **M** 3/2  Human Diet II: Lactase and Aldehyde Dehydrogenase
- **W** 3/4  Diabetes and Hypertension
- **F** 3/6  Coevolution with Diseases

**Week 9**
- **M** 3/9  Reproductive Health and Fertility
- **W** 3/11  Sexuality and Gender
- **F** 3/13  Language Genes

**Spring Break**  NO CLASS
- **3/16 - 3/20**
Schedule of Lecture Topics (continued):

Week 10
- M 3/23 Modern Human Geographical Variation
- W 3/25 The History of Race in America
- F 3/27 MIDTERM EXAM #2

Part 3: Artificial Selection and Human Effects on the Natural World

Week 11
- M 3/30 The Domestic Dog as a Model of Artificial Selection
- W 4/1 Artificial Selection and the History of Agriculture
- F 4/3 Domestication of Animals: Livestock

Week 12
- M 4/6 Human-Animal Pathogen Exchange
- W 4/8 Emerging Viruses
- F 4/10 Vaccine Development

Week 13
- M 4/13 Domestication of Plants: Corn
- W 4/15 Agriculture and Sustainability
- F 4/17 Genetically Modified Organisms: Myth Versus Fact

Week 14
- M 4/20 Habitat Destruction and Fragmentation
- W 4/22 Pollution and Bioremediation
- F 4/24 Alternative Energy Sources and Bioengineering

Week 15
- M 4/27 Controversy Over Evolution
- W 4/29 The Relevance of Evolution
- F 5/1 Final Exam Review

W 5/6 **FINAL EXAM:** 11:00 AM - 1:00 PM

Grading: After each exam, grade cut-offs will be released. There is not an absolute number of points that predetermines a latter grade of A, A-, B+, B, B-, etc. The final letter grade for this course will be assigned on a curve, determined by the total number of points as given below.

The point system will total **700 points**, as follows:

- Midterm Exam #1: 150
- Midterm Exam #2: 150
- Final Exam: 150
- Lab Worksheets (12): 180
- Lab Presentation: 70
- Total: 700
### Schedule of Laboratory Topics and Assignments:

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<th>Week</th>
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<th>Topic</th>
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<tr>
<td>1</td>
<td>1/12-1/16</td>
<td>NO LAB</td>
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<tr>
<td>2</td>
<td>1/19-1/23</td>
<td>Lab 1: The Scientific Method</td>
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<td>Lab 2: Data Collection and Analysis</td>
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<td>2/16-2/20</td>
<td>Lab 5: Foraging Behavior/ Bacterial Evolution II</td>
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<td>7</td>
<td>2/23-2/27</td>
<td>Lab 6: Paleontology/Bacterial Evolution III</td>
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<td>8</td>
<td>3/2-3/6</td>
<td>Lab 7: Discovering Ardi/Bacterial Evolution IV</td>
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<td>9</td>
<td>3/9-3/13</td>
<td>Lab 8: Hominid Fossil Analysis</td>
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<td>3/16-3/20</td>
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<td>10</td>
<td>3/23-3/27</td>
<td>Lab 9: Language and Symbolism</td>
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<td>Lab 10: Craniometry</td>
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<td>14</td>
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<td>Student Presentations</td>
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<tr>
<td>15</td>
<td>4/27-5/1</td>
<td>Student Presentations</td>
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**Lab Worksheets:**

For each of the twelve laboratory meetings, a 15-point lab worksheet will be handed out at the beginning of lab and collected at the start of the following week’s lab. Worksheets will require students to organize, analyze, and interpret their data, as well as to answer questions about their comprehension of the conceptual material from each lab.

**Lab Presentations:**

The last two weeks of the semester will be devoted to 70-point student presentations on topics of the students’ choice related to communicating evolution to the public. Detailed instructions and guidelines, including deadlines for topic submission, will be posted on Blackboard in the beginning of the semester.
Statement for Students with Disabilities:

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early in the semester as possible, preferably by January 30, 2015. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website for DSP and contact information: (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu. If a student’s approved accommodation is limited to extra time on examinations, the teaching staff of BSIC 180 will provide the accommodation. For any other accommodation, such as a private room, reader, or a scribe, students must make prior arrangements with the DSP office 2 weeks before the exam date.

Statement on Academic Integrity:

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook, contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Emergency Preparedness/Course Continuity in a Crisis:

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies. See the university’s site on Campus Safety and Emergency Preparedness.