ANTH 175: EVOLUTIONARY MEDICINE (VERSION 9.30.19)

Fall Quarter 2019 (CRN: 16109)
Lawrence 177  Tuesdays & Thursdays 10:00-11:20 am

4 Credit Hours; Satisfies an SC Group Requirement

Professor: Dr. Josh Snodgrass (website: http://www.pinniped.net/snodgrass.html)
Office Hours: Mondays 4:00-5:00, Thursdays 11:30-12:30 & by appointment
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Graduate Student Teaching Assistants:
Colin Brand (cbrand2@uoregon.edu; https://anthropology.uoregon.edu/profile/cbrand2/)
Office Hours: Thursdays 11:30-12:30 & Fridays 12-1; Office: Condon 302D
Jenneca McCarter (jennecam@uoregon.edu; https://anthropology.uoregon.edu/profile/jennecam/)
Office Hours: Fridays 9-11; Office: Condon 365

Course Description: Application of evolutionary thinking to the study of human health and disease

Format: Lecture (with embedded discussion) and required weekly laboratory sections.

Course Content: This course provides an introduction to evolutionary (or Darwinian) medicine, a relatively new field that recognizes that evolutionary processes and human evolutionary history shape health among contemporary human populations. The field of evolutionary medicine emphasizes ultimate explanations, such as how natural selection and other evolutionary forces shape our susceptibility to disease; this perspective complements that of biomedicine, which generally focuses on identifying the immediate mechanisms that give rise to diseases and malfunctions. The evolutionary medicine approach has provided insights into why diseases occur at all and additionally has produced valuable insights on treatment strategies. This course will examine a variety of diseases using an evolutionary perspective, including infectious diseases, mental disorders and cancers, and focus attention on the role of diet and psychosocial stress in the development and progression of cardiovascular disease, obesity, and diabetes.

Expanded Course Description: This is a science group satisfying course that is designed to be a comprehensive introduction to evolutionary, or Darwinian, medicine. In brief, evolutionary medicine is the application of evolutionary thinking, including evolutionary processes and human evolutionary history, to understanding health and disease among contemporary human populations. This course uses a scientific approach, drawing on the methods, theories, and bodies of knowledge from various scientific disciplines, including evolutionary biology, genetics, neuroscience, physiology, nutritional sciences, and medicine.

This course has four main sections:

Section 1 introduces students to the scientific method and evolutionary theory, and builds the foundation for the understanding the evolutionary medicine approach. Particular attention is directed towards the adaptation concept and life history theory. This section of the course also provides an introduction to human evolutionary history, concentrating on key events in hominin evolution (e.g., bipedalism and brain evolution), and to modern human biological variation.

Section 2 focuses on the basic principles of evolutionary medicine, and emphasizes differences between proximate and ultimate explanations. This section of the course also provides a basic introduction to anthropological/biocultural perspectives and epidemiology (the study of patterns of human disease and their causes), as well as a brief discussion of contemporary global health issues.
Section 3 uses the evolutionary medicine approach to examine infectious diseases. This section of the course provides an introduction to human defenses to infectious organisms, and describes major cultural transitions in human history that altered exposure to infectious disease. This section also focuses on infectious diseases such as HIV.

Section 4 applies the evolutionary medicine approach to chronic diseases, with an emphasis of cardiovascular diseases (heart disease and stroke), obesity, and diabetes. This section of the course also highlights the biocultural framework to examine the role of diet and psychosocial stress in the development and progression of chronic conditions.

GENERAL EDUCATION: SCIENCE
This is a group-satisfying general education science (SC) course that introduces students to the foundations of several scientific disciplines (in particular, biological anthropology, biology, biomedicine, and epidemiology/public health), and provides an introduction to the fundamental process of scientific reasoning.

General education is the cornerstone of a liberal arts and sciences education. General education allows students to explore in disciplines that they may never have had the opportunity to explore and to make connections among ostensibly disparate ideas and intellectual traditions. A liberal arts and sciences education prepares students to understand major societal challenges, to think critically and flexibly about solutions, to consider complex ethical issues, and to provide leadership on a variety of global issues.

In this time of movement away from a liberal arts and science education in favor of technical training for what are deemed to be economically valuable professions, the UO undergraduate education embraces an educational foundation that incorporates and integrates the natural sciences, the social sciences, and the humanities. This type of education is more important now than ever. This deep and flexible knowledge serves as a Swiss Army Knife—with a variety of mental tools—that helps students navigate their future, and prepares them for an ever-shifting job market that will likely include multiple career paths.

LEARNING OBJECTIVES
After successful completion of this course, students will have an understanding of the following key issues:

→ The scientific method as a way of knowing and how it serves as a way to ensure accountability for factual claims
→ The basic principles of evolutionary biology and human genetics
→ The major trends in hominin evolution and how humans have adapted biologically to their environments
→ The basic concepts and terminology used in the field of epidemiology/public health
→ The distinction between proximate and ultimate explanations for human biology and disease
→ The general pattern of health change throughout human prehistory and history, and across populations
→ How the biocultural approach to health can provide a window onto such issues as obesity, cardiovascular disease, birth complications, HIV/AIDS, autoimmune diseases, and allergy
→ The explanatory framework that the environmental mismatch approach uses to explain chronic disease, infectious conditions, and mental disorders in contemporary human populations
→ How evolutionary approaches to health and disease can inform public health policy decisions

Accommodations: Appropriate accommodations will be provided for students with documented disabilities. If you anticipate needing accommodations in this course, please make arrangements to meet with me soon. We are happy to help so please reach out!

Required Readings: Assorted articles and book chapters (see below)

Canvas: The Canvas site for this class will be your main source for course information, documents, and announcements. Make sure that you check your UO e-mail account every day as we regularly post announcements.

Expectations and Grading: Attendance at lectures and participation in lab sections is expected. Course readings may be very useful for passing exams, completing lab assignments, and participating in lab section activities.
Your grade in the course will reflect performance on the midterm and final, two quizzes, 4 lab write-ups, and one policy white paper (and accompanying presentation).

- **Quiz 1** (online; **end of week 4**) 10%
- **Midterm Exam** (in class; **10/31**) 20%
- **Quiz 2** (online; **end of week 8**) 10%
- **Final Exam** (in class; **12/9, 8:00-10:00 am**) 20%
- **Lab Exercises** (4 short lab write-ups @ 5% each) 20%
- **Public Health Policy White Paper and Presentation** (*Group Project*) 20%

*Note: Practice Quiz 1* (online; **end of week 3**) 0%
*Note: Practice Quiz 2* (online; **end of week 7**) 0%

The quizzes, midterm, and final exam will cover lectures, readings, videos, and lab section material. **Use the lecture notes as your primary tool for studying.**

**Exams and assignments must be taken/turned in at the scheduled time**—**under no circumstances will make-up exams or assignment extensions be given without a documented excuse** (e.g., note from your doctor). If you will not be able to take an exam or turn in an assignment, you **must** notify me or your TA in advance (preferably by e-mail).

**Quizzes:** The quizzes will be multiple choice and will be timed. Each quiz will have 30 MC questions, taken on Canvas.

**Midterm and Final Exam:** The midterm and final exams will include MC, matching, and short answer (2-3 sentences) sections. The **final exam will be cumulative** but will emphasize material from the second half of the course.

**Lab Exercises:** Sections will consist of lab exercises and discussion and are designed with two purposes: 1) introduce new material—both through lab activities and discussion—that complements what we cover in lecture; and 2) review key concepts from the lecture and readings—and this is a time to ask questions. Attendance is expected but not counted towards your grade. Over the term, you will turn in 4 short lab write-ups—these should require minimal write-up time outside of your lab section and they will help you prepare for exams.

**Public Health Policy White Paper:** During the term, each student will participate in a group activity of 3 students and will write a 2-3 page (single-spaced) public health policy white paper on one of the following topics: 1) Alzheimer’s Disease; 2) Opioid Addiction; 3) Drug-Resistant Infections; 4) Alcoholism; 5) Type 2 Diabetes; 6) Autism; 7) Anxiety Disorders; or, 8) Lyme Disease. The group will also give a 5-minute presentation in their lab section that summarizes their white paper.

The goal of this assignment is to focus attention on an important contemporary public health issue, providing a statement of the problem (e.g., prevalence, developmental profile, populations impacted, etc.) and consideration of the utility of an evolutionary perspective. The white paper then provides a public health recommendation, with a justification for the intervention and a consideration of the pros and cons of the recommendation.

Grades will be assigned as follows: A = 90-100%, B = 80-89%, C = 70-69%, D = 60-69%, F < 60% (with minus and plus grades assigned at appropriate cutoffs).

The grading system used in this course is as follows:

- **A** – Outstanding performance relative to that required to meet course requirements; demonstrates a mastery of course content at the highest level.
- **B** – Performance that is significantly above that required to meet course requirements; demonstrates a mastery of course content at a high level.
- **C** – Performance that meets the course requirements in every respect; demonstrates an adequate understanding of course content.
- **D** – Performance that is at the minimal level necessary to pass the course but does not fully meet the course requirements; demonstrates a marginal understanding of course content.
- **F** – Performance in the course, for whatever reason, is unacceptable and does not meet the course requirements; demonstrates an inadequate understanding of the course content.
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<tr>
<th>Week</th>
<th>Dates</th>
<th>Topics</th>
<th>Readings</th>
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| 1    | 10/1  | Course Overview and Requirements | 1) Shubin 2009  
2) Nesse 2016  
3) Williams 2018 |
|      | 10/3  | Anthropology, Science, & Evolution: General Education & Liberal Arts and Science Education; Anthropology; Scientific Method; Earliest Evolutionary Studies | 1) Zakaria 2015 |
|      |       | Week 1 Lab: Intro; Scientific Method; Basic & Applied Science **(Lab write-up due in lab the following week)** | Lab readings  
1) Firestein 2012  
2) Bering 2012 |
| 2    | 10/8  | Basics of Evolutionary Medicine: The History of the Field & Its Key Players; Proximate vs. Ultimate Explanations | 1) Zuk 2007 (Ch1) |
|      | 10/10 | Basics of Evolutionary Medicine, Part 2: Evolutionary Explanations of Disease; Anthropological & Epidemiological Approaches | 1) Wiley & Allen 2013  
2) Schneider 2017 (Ch4) |
|      |       | Week 2 Lab: Evolutionary Theory **(Lab write-up due in lab the following week)** | Lab readings  
1) Johnson 2011  
2) UCMP 2012a  
3) UCMP 2012b |
|      | 10/17 | Evolutionary Biology, Part 1: Natural Selection & Adaptation; How Evolution Works; Biological Basis of Life | 1) Jurmain et al. 2011 (Ch3) |
|      |       | Week 3 Lab: Anthropometry (Body size, proportions, and composition) & biomarkers/disease markers **(Lab write-up due in lab the following week)** | 1) Stanford et al. 2008 (Ch5)  
2) Gluckman & Hanson 2006 (Ch2) |
<p>|      |       | <em>Practice quiz on Weeks 1-3 (Online; can be taken anytime 10/19-10/21; Does not count toward your grade)</em> | 1) Gluckman et al. 2016 (Ch6) |
| 4    | 10/22 | Evolutionary Biology, Part 2: Modern Synthesis; Adaptation; Evolution and Development | <strong>Quiz on Anthropology; Science; Evolutionary Medicine; Evolutionary Biology; &amp; Human Evolution (Online, can be taken anytime 10/26 - 10/28; Covers everything from Weeks 1-4)</strong> |
|      | 10/24 | Evolutionary Biology, Part 3: Human Evolutionary History | |</p>
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<td>5</td>
<td>10/29</td>
<td><strong>Evolutionary Biology, Part 4: Modern Human Origins; Human Adaptation and Adaptability</strong></td>
<td>1) Jurmain et al. 2011 (Ch12)</td>
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<td>10/31</td>
<td><strong>Midterm Exam (In Class—Covers everything from Weeks 1-5)</strong></td>
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<td><strong>Week 5 Lab: Video: Rx for Survival: A Global Health Challenge—Disease Warriors (Video questions do NOT get turned in—use as study guide)</strong></td>
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<td>6</td>
<td>11/5</td>
<td><strong>An Evolutionary Perspective on Childbirth and Birth Complications—Guest Lecture by Dr. Missy Cheyney (OSU)</strong></td>
<td>TBA</td>
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|      |             | **Week 6 Lab: Public health policy & evolutionary approaches (Birth complications, low back pain, and HIV/AIDS, and cookie dough?) and Dedicated Group Work Time for the White Paper Assignment** | 1) Anderson 2016  
2) Castillo & Lieberman 2015  
3) Ball & Russell 2014  
4) Frieden 2013 |
| 7    | 11/12       | **Global Health, Part 2: The Big Picture of Global Health Trends & Historical Patterns; Epi Transitions; Health Disparities; Video Segment: Trends in Life Expectancy** | 1) Schneider 2017 (Prologue)                                          |
|      | 11/14       | **An Evolutionary Perspective on Allergy & Autoimmune Disease: Changing Worlds & the Price of Victory over Infectious/Parasitic Disease; Dysregulation!** | 1) Zuk 2007 (Ch2) 
2) Stearns & Medzhitov 2016 (Ch8—pp. 233-237)  
3) Velasquez-Manoff 2015 |
|      |             | **Week 7 Lab: Food Production; Skeletal Health/Paleopathology **(Lab write-up due in lab the following week)** |                                                                         |
|      |             | *Practice quiz on Weeks 6 & 7 (Online; can be taken anytime 11/16-11/18; Does not count toward your grade)* |                                                                         |
| 8    | 11/19       | **An Evolutionary Perspective on Sexually Transmitted Diseases (STDs)** | 1) Zuk 2007 (Ch5)                                           
2) Perlman 2013                                                  |
|      | 11/21       | **An Evolutionary Perspective on HIV & SIV—Guest Lecture by Dr. Kirstin Sterner (UO)** | TBA                                                                    |
|      |             | **Week 8 Lab: Discussion: Current Issues in Public Health (Public Health vs. Individual Rights: Vaccination & Quarantine)** | 1) Couzin-Frankel 2009  
2) Specter 2011  
3) Wilson 2007  
4) Kaiser 2013  
5) Healy & Paulson 2015 (Read at least 2) |
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<td>9</td>
<td>11/26</td>
<td><strong>Evolution of the Human Diet, Part 1:</strong> The Human Diet in Evolutionary Perspective; The Nutrition Transition</td>
<td>1) Wiley 2015</td>
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<td>11/28</td>
<td><strong>No Class—Thanksgiving!</strong></td>
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<td><strong>No Week 9 Lab—Thanksgiving!</strong></td>
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<td>10</td>
<td>12/3</td>
<td><strong>Evolution of the Human Diet, Part 2:</strong> Obesity and Cardiovascular Disease: The Nutrition Transition; Obesity; The Obesogenic Environment; Diet &amp; Physical Activity</td>
<td>1) Stearns &amp; Medzhitov 2016 (Ch8—pp. 219-232) 2) Jabr 2013</td>
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<td>12/5</td>
<td><strong>Evolution of the Human Diet, Part 3:</strong> Obesity and Cardiovascular Disease: Mismatch; Should We Be Eating a Paleodiet and What Does That Even Mean? <strong>How to Live a Long and Healthy Life</strong></td>
<td>1) Lieberman 2013 (Ch13)</td>
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<td><strong>Week 10 Lab: Group Presentations on Policy/White Papers</strong></td>
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<td>12/9</td>
<td><strong>Final Exam, Monday, December 9, 8:00-10:00 am</strong> (In Class [in the regular classroom!)]—Cumulative but emphasizes material from weeks 6-10)**</td>
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Week 1 Readings


Lab readings for week 1

- Bering J. 2012. How are they hanging? This is why they are. In: *Why is the Penis Shaped Like That?…And other Reflections on Being Human*. Scientific American/FSG, pp. 3-10.

Week 2 Readings


Lab readings for week 2


Week 3 Readings


Week 4 Readings

**Week 5 Readings**

**Week 6 Readings**
- Dr. Cheyney readings TBA

**Lab readings for week 6**
- Anderson LV. 2016. The FDA's abstinence-only approach to eating cookie dough is unrealistic and alarmist. *Slate* (7/1/16)

**Week 7 Readings**

**Week 8 Readings**
- Dr. Sterner’s reading TBA

**Lab readings for week 8 (Read at least two):**

**Week 9 Reading**

**Week 10 Readings**