

EVOLUTIONARY MEDICINE

ANTHROPOLOGY 175
CRN: 26629

WINTER
2018

Class Time: Tuesday and Thursday 12:00-1:20

Location: 182 Lillis Hall (LIL)

Instructor: Dr. Klaree Boose (boose@uoregon.edu)

Office: 374 Condon Hall

Office Hours: Thursdays 1:30-3:30 and by appointment

GE's: Josh Schrock (jschroc2@uoregon.edu) / Office Hours: Thursday 9:30-11:30

Aileen Fernandez (aileenf@uoregon.edu) / Office Hours: Thursday 10:00-12:00

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

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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 epidemiology (the study of patterns of human disease and their causes) and 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 emerging infectious diseases.

Section 4 applies the evolutionary medicine approach to chronic diseases, including cancers and osteoporosis. This section of the course emphasizes cardiovascular diseases (heart disease and stroke), obesity, and diabetes and uses a biocultural framework to examine the role of diet and psychosocial stress in the development and progression of these 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, 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

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- 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
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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.

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 Canvas-linked e-mail account every day.

Expectations and Grading: Attendance at lectures and participation in lab sections is expected. Course readings are essential to passing exams, completing lab assignments, and participating in lab section activities. Your grade in the course will reflect performance on the midterm and final, four quizzes, 5 lab write-ups, and one policy white paper:

- Quiz 1 (online; end of week 3) 5%
- Quiz 2 (online; end of week 4) 5%
- Midterm Exam (in class; 2/15) 20%
- Quiz 3 (online; end of week 8) 5%
- Quiz 4 (online; end of week 9) 5%
- Final Exam (in class; 3/20) 20%
- Lab Exercises (4 short lab write-ups @ 5% each) 20%
- Public Health Policy White Paper and Presentation (*Group Project).. 20%

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.

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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 GE in advance (preferably by e-mail).

Quizzes: The quizzes will be multiple choice and will be timed. Each quiz will have 15 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.

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) Zika/Emerging Infectious Diseases
- 3) Drug-Resistant Infections
- 4) Alcoholism / Opioid Addiction
- 5) Type 2 Diabetes
- 6) Autism
- 7) Anxiety Disorders
- 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.

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Course Format:

The course consists of lectures and required laboratory sections. The required laboratory sections are a critical part of the course and are designed to develop practical skills of observing, measuring, and interpreting data collected by biological anthropologists. A Canvas site will be maintained for this class, which will be your main source for course information, documents, grades, and announcements. Make sure that you regularly check your Canvas-linked e-mail account, however, **DO NOT email me through the Canvas site.** Please email me directly at boose@uoregon.edu if you have questions.

Grading: Letter grades will be assigned 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.

GRADE SCALE:

A+ = 97%	A = 94%	A- = 90%	B+ = 87%	B = 84%
B- = 80%	C+ = 77%	C = 74%	C- = 70%	D+ = 67%
D = 64%	D- = 60%	F = < 60%		

GENERAL INFORMATION

ADA Statement: Students with documented disabilities who may need accommodations, who have any emergency medical information the instructor should know of, or who need special arrangements in the event of evacuation, should make an appointment with the instructor as early as possible, no later than the first week of the term. Students may also wish to contact UO Disability Services Office at 541-346-1155. NOTE: As per FERPA regulations Faculty are no longer automatically informed as to the ADA status of students. If you have special requirements, you must bring your information to me as soon as possible.

Equal Opportunity Compliance Statement: It is the policy of the University of Oregon Board of Directors that there will be no discrimination or harassment on the basis of age, disability, gender, marital status, national origin, race, religion, sexual orientation, or veteran status in any educational programs, activities or employment. Persons having questions about equal opportunity and non-discrimination should contact the Office of Affirmative Action at 541-346-3123.

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CLASS SCHEDULE (subject to change)

Week	Dates	Overview	Reading
1	1/09	Course Overview and Requirements	1. Shubin 2009 2. Nesse 2016 3. Zimmer 2015
	1/11	Anthropology, Science, and Evolution: General education and liberal arts and science education; Anthropology; Scientific Method; early evolutionary studies	1. Jurmain et al. (Ch 2)
	1/12	<u>Week 1 Lab:</u> Introduction to the Scientific Method; Basic and Applied science (write-up due by end of Week 2 lab)	<u>Lab readings:</u> 1. Firestein 2012 2. Bering 2012
2	1/16	Evolutionary Biology, Part 1: Natural Selection and adaptation; how evolution works; biological basis of life	1. Jurmain et al. (Ch 3)
	1/18	Catch-up (if necessary); Video – <i>Darwin's Dangerous Idea</i>	[No new readings – catch up if necessary]
	1/19	<u>Week 2 Lab:</u> Evolutionary Theory (write-up due by end of Week 3 lab); form White Paper groups and choose topic	<u>Lab reading:</u> 1. Johnson 2011
3	1/23	Evolutionary Biology, Part 2: Modern Synthesis; evolution and development	1. Stanford et al. 2008 (Ch 5)
	1/25	Evolutionary Biology, Part 3: Human evolutionary history	1. Gluckman et al. 2016 (Ch 6)
	1/26	<u>Week 3 Lab:</u> Introduction to the White Paper *Homework: Video – <i>Ghost in Your Genes</i> (video questions do NOT get turned in – use as study guide) **Quiz 1 on the Scientific Method and Evolutionary Biology (online – to be taken anytime 1/27-1/29; covers Weeks 1-3)	
4 (cont. below)	1/30	Evolutionary Biology, Part 4: Modern human origins; human adaptation and adaptability	1. Jurmain et al. 2011 (Ch 12)

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7 (cont.)	2/23	<u>Week 7 Lab: Food production; skeletal health/paleopathology (write-up due by the end of week 8 lab)</u>	
8	2/27	Allergy and Autoimmune Disease, Part 1: Changing worlds and the price of victory over infectious/parasitic disease	1. Zuk 2007 (Ch 2) 2. Stearns and Medzhitov 2016 (Ch8-pp. 233-237)
	3/1	Allergy and Autoimmune Disease, Part 2: Dysregulated immune systems and microbiomes; Big Bad Gluten?	1. Velasquez-Manoff 2015
	3/2	<u>Week 8 Lab: Discussion – Current Issues in Public Health (Public Health vs. Individual Rights – Vaccination and Quarantine)</u> **Quiz 3 (online – to be taken anytime 3/3-3/5; covers everything but emphasizes Weeks 7-8)	<u>Lab Readings:</u> (read at least 2) 1. Couzin-Frankel 2009 2. Specter 2011 3. Wilson 2007 4. Kaiser 2013 5. Healy and Paulson 2015
9	3/6	Evolution of the Human Diet, Part 1: The human diet in evolutionary perspective; the Nutrition Transition	1. Wiley 2015 (Ch 28)
	3/8	Evolution of the Human Diet, Part 2: Obesity and cardiovascular disease, the Obesogenic Environment, diet and physical activity	1. Bellisari 2013
	3/9	<u>Week 9 Lab: Work on White Paper and group presentations</u> **Quiz 4 on material since the midterm (online – to be taken anytime 3/10-3/12; covers everything but emphasizes Weeks 7-9)	
10	3/13	Evolution of the Human Diet, Part 3: Mismatch, should we be eating a Paleo diet and what does that even mean?	1. Jabr 2013
	3/14	***White Paper due 8:00pm – turn in online	
	3/15	How to live a long and healthy life and how Evolutionary Medicine can help	1. TBD
	3/16	<u>Week 10 Lab: Group presentations on policy</u>	
Final	3/20	FINAL EXAM – Tuesday, 8:00am-10:00am LIL 182	