

ANTH 175: EVOLUTIONARY MEDICINE
Fall Quarter 2020 (CRN: 10595); 4 Credit Hours
Satisfies an SC Core Ed Requirement & a Global Health Minor NS Elective Requirement

Professor: Dr. Josh Snodgrass (website: <http://www.pinniped.net/snodgrass.html>)

Office Hours: Open Zoom Office Hours Mondays 2:00-3:00 & private Zoom meetings by appointment

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Graduate Student Teaching Assistants (TAs/GEs):

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

Format: WEB (Recorded lectures, live Zoom discussion Wednesdays 2:00-3:00, and live weekly Zoom lab sections)

Canvas: A Canvas site will be used extensively, it being the main source for course materials, information, readings, lab materials, and announcements. Make sure that you check your Canvas-linked e-mail account daily.

Required Readings: No books are assigned. Instead we use assorted articles and book chapters (on Canvas; see below)

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 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, with an emphasis of cardiovascular diseases, 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 core education-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, UO undergraduate education embraces a foundation that incorporates and integrates natural sciences, 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.

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 epidemiology and 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. Please make arrangements to meet with me or your TA/GE to discuss these accommodations.

Expectations and Grading: Viewing of lectures and participation in lab sections required. Course readings are very helpful as a supplement to lectures, in completing lab assignments, and participating in lab activities. Students are encouraged to attend and participate in the Wednesday online class discussion. Your course grade will reflect performance on 4 quizzes, 3 lab write-ups, and a multipart Public Health White Paper project.

Quizzes.....40%

Quiz 1 (Online, covers weeks 1-3; Must be taken 10/15 - 10/18), 10%

Quiz 2 (Online; covers weeks 4-5; Must be taken 10/29 - 11/1), 10%

Quiz 3 (Online; covers weeks 6-7; Must be taken 11/12 – 11/15), 10%

Quiz 4 (Online; covers weeks 8-9; Must be taken 11/26 -11/29), 10%

Lab Write-Ups.....15%

Week 2 Lab (Evolutionary & Biocultural Approaches; Write-up due 10/16), 5%

Week 3 Lab (Anthropometry & Biomarkers/Disease Markers; Write-up due 10/23), 5%

Week 7 Lab (Food Production & Paleopathology; Write-up due 11/20), 5%

Public Health White Paper.....45%

Scaffolding Assignment 1 (Topic & group division of labor; Due 10/25), 5%

Scaffolding Assignment 2 (Why this condition & this intervention; Due 11/8), 5%

Scaffolding Assignment 3 (Evolutionary and/or biocultural component; Due 11/22), 5%

Group Presentation (In Lab Section; Week 10), 10%

Final Public Health White Paper (Due 12/9), 20%

Quizzes: Quizzes are based on lectures, readings and labs, and will be multiple choice on Canvas. Each quiz will have 30 MC questions. Quizzes must be taken at the scheduled time. Make-up quizzes will not be given without a documented excuse (e.g., signed note from a doctor). If you will not be able to take a quiz, you must notify us in advance by e-mail.

Lab Write-Ups: During the term, each student will write three SHORT (1-2 page) lab write-ups based on the exercises and questions from lab activities. ***All lab sections will be run by TAs Alicia DeLouize and Samantha Queeno.***

Public Health Policy White Paper: During the term, each student will participate in a group activity of 3 students and will write a 3-page (single-spaced; plus 1 page references) Public Health Policy White paper on one of the following ten topics: 1) Alzheimer's Disease; 2) Opioid Addiction; 3) Drug-Resistant Infections (e.g., MRSA); 4) Ebola; 5) Influenza; 6) Autism; 7) Type 2 Diabetes; 8) Autoimmune Diseases; 9) Depression; or, 10) Cancers.

The goal of this assignment is to focus attention on an important current public health issue in the US, providing a statement of the problem (e.g., prevalence, developmental profile, populations impacted, etc.) and consideration of the utility of evolutionary and biocultural perspectives. 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.

This is an iterative writing assignment with three assignments due during the term (with feedback provided by Alicia and Samantha) and the final document submitted during Finals Week (12/9). Also, your team will present this White Paper to your lab during Week 10.

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.

SCHEDULE:

Week	Dates	Topics	Readings
1	9/28	No class; Yom Kippur holiday	1) Shubin 2009 2) Nesse 2016 3) Zimmer 2015 4) Gravlee 2020
	9/30	Course Overview and Requirements <u>Week 1 Lab: Intro; Scientific Method; Basic & Applied Science</u>	<u>Lab readings</u> 1) Firestein 2012 2) Bering 2012
2	10/5	Anthropology, Science, & Evolution: GenEd & Liberal Arts; Anthropology; Science; Earliest Evolutionary Studies	1) Zakaria 2015 2) Wiewel 2020
	10/7	Basics of Evolutionary Medicine, Part 1: The History of the Field & Its Key Players; Proximate vs. Ultimate Explanations; Starting to talk about COVID <u>Week 2 Lab: Evolutionary & Biocultural Approaches</u> <u>**(Lab write-up due 10/16)**</u> <u>*Practice quiz on Weeks 1-2 (10/8 - 10/11; Does not count toward your grade)*</u>	1) Zuk 2007 (Ch1) 2) Leonard 2020 <u>Lab reading</u> 1) Gravlee 2020 (Note: same as week 1 Gravlee 2020)

Week	Dates	Topics	Readings
3	10/12	Basics of Evolutionary Medicine, Part 2: Evolutionary Explanations of Disease; Anthropological & Epidemiological Approaches	1) Wiley & Allen 2013 2) Schneider 2017 (Ch4)
	10/14	Evolutionary Medicine Case Study: The Indigenous Siberian Health and Adaptation Project <u>Week 3 Lab: Anthropometry (Body size, proportions, and composition) & biomarkers/disease markers</u> <u>**(Lab write-up due 10/23)**</u> <u>**Real Quiz on everything weeks 1-3 (10/15 - 10/18)**</u>	1) Leonard et al. 2009
4	10/19	Evolutionary Medicine Case Study: COVID. Evolution of Coronaviruses and Spillover into Humans; Human Susceptibilities; Risk Factors & Social Determinants	1) Gravlee 2020 2) Katzmarzk et al. 2020 3) Gildner & Thayer 2020
	10/21	Evolutionary Biology, Part 1: Natural Selection & Adaptation; How Evolution Works; Biological Basis of Life <u>Week 4 Lab: Public health policy & evolutionary approaches; Public Health Messaging (Birth complications & Addressing COVID) (& Dedicated group work time)</u> <u>**White Paper Scaffolding assignment 1 (Topic & Team members/team division of labor), Due 10/25**</u>	1) Jurmain et al. 2011 (Ch3) <u>1) Ball & Russell 2014</u> <u>2) Lewis 2020</u> <u>3) Shafer 2020</u>
5	10/26	Evolutionary Biology, Part 2: Modern Synthesis; Adaptation; Evolution and Development	1) Stanford et al. 2008 (Ch5) 2) Gluckman & Hanson 2006 (Ch2)
	10/28	Evolutionary Biology, Part 3: Human Evolutionary History; The Fossil Evidence for Human Evolution <u>Week 5 Lab: Video: <i>Ghost in Your Genes</i> (Video questions do NOT get turned in—use as study guide)</u> <u>**Real Quiz on everything weeks 4-5 (10/29 - 11/1)**</u>	1) Gluckman et al. 2016 (Ch6)
6	11/2	Evolutionary Biology, Part 4: Modern Human Origins; Contemporary Human Adaptation and Adaptability	1) Jurmain et al. 2011 (Ch12)
	11/4	Global Health, Part 1: The Biocultural Approach & Epidemiology: Biocultural Approach & Methods in Epidemiology and Public Health <u>Week 6 Lab: Focus on COVID Discussion: Social Determinants of Health</u> <u>**White Paper Scaffolding Assignment 2 (Why this condition & your intervention), Due 11/8**</u>	1) Relethford 2010 (Ch17) <u>1) Yarris 2020</u>

Week	Dates	Topics	Readings
7	11/9	Global Health, Part 2: The Big Picture of Global Health: Trends & Historical Patterns; Epi Transitions; Global Disparities; Video Segment: <i>Trends in Life Expectancy</i>	1) Schneider 2017 (Prologue) 2) Schneider 2017 (Ch1 + bits of Ch4 & Ch5)
	11/11	Global Health, Part 3: Global Health Changes in the Past Century: Economic Development; Social Determinants of Health in the US; Climate Change & Health <u>Week 7 Lab: Food Production; Skeletal Health/Paleopathology **(Lab write-up due 11/20)**</u> **Real Quiz on everything weeks 6-7 (11/12 - 11/15)**	1) Sapolsky 2018 2) Kivland & Sosin 2018
8	11/16	Rx for Survival video	No new readings
	11/18	Global Health, Part 4: An Evolutionary Perspective on Allergy & Autoimmune Disease: Changing Worlds & the Price of Victory over Infectious/Parasitic Disease; Dysregulated Immune Systems and Microbiomes; Big Bad Gluten? <u>Week 8 Lab: Focus on COVID Discussion: How are we going to handle COVID Vaccination?</u> **White Paper Scaffolding Assignment 3 (Evolutionary and/or biocultural component), Due 11/22**	1) Zuk 2007 (Ch2) 2) Stearns & Medzhitov 2016 (Ch8—pp. 233-237) 3) Gildner 2020 <u>Lab Readings:</u> 1) Jong-Fast 2020 2) Koerth 2020 3) Khullar 2020
9	11/23	Emerging & Reemerging Infectious Diseases: Ebola, TB, HIV/AIDS	1) Zuk 2007 (Ch10) 2) Mandavilli 2020
	11/25	An Evolutionary Perspective on Sexually Transmitted Infections (STIs) <u>No Lab this Week—Thanksgiving</u> **Real Quiz on everything weeks 8-9 (11/26 - 11/29)**	1) Zuk 2007 (Ch5) 2) Perlman 2013
10	11/30	Returning to COVID: What Have We Learned & Where Do We Go From Here (Are We Out of the Death Spiral?)	1) Yong 2020 2) Crist 2020
	12/2	Putting it all Together: How to Live a Long and Healthy Life & What Are the Big Risks for our Species <u>Week 10 Lab: Group Presentations on White Paper</u>	No new readings
11	12/9	**Public Health White Paper Final Document Due (turn in one copy per group)**	

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Week 1

For Wednesday's Class (9/30)

- Shubin NH. 2009. This old body. *Scientific American* 300, Issue 1 (January 2009): 64-67.
- Nesse RM. 2016. Evolutionary medicine: The top 10 questions. *This View of Life* blog, 6/27/16. <https://evolution-institute.org/article/evolutionary-medicine-the-top-ten-questions/#>
- Zimmer C. 2015. Inuit study adds twist to omega-3 fatty acids' health story. *The New York Times*, 9/17/15.
- Gravlee C. 2020. Racism, not genetics, explains why black Americans are dying of COVID-19. *Scientific American*, 6/7/20.

Lab Readings for Week 1

- Firestein S. 2012. What science wants to know. *Scientific American*, 4/2012.
- 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

For Monday's Class (10/5)

- Zakaria F. 2015. Why America's obsession with STEM education is dangerous. *Washington Post*, 3/26/15.
- Wiewel W. 2020. The Case for Liberal Arts Education in a Time of Crisis, *The New Republic*, 5/27/20. <https://newrepublic.com/article/157845/case-liberal-arts-college-coronavirus-crisis>

For Wednesday's Class (10/7)

- Zuk M. 2007. Why Doctors Need Darwin (Chapter 1). In: Riddled with Life: Friendly Worms, Ladybug Sex, and the Parasites that Make Us Who We Are. Harcourt Press. pp. 38-63.
- Leonard, W.R., 2020. The role of human biology in addressing the COVID-19 pandemic. *American Journal of Human Biology*, 32(3).

Lab Reading for Week 2

- Gravlee C. 2020. Racism, not genetics, explains why black Americans are dying of COVID-19. *Scientific American*, 6/7/20. (Note: this is the same reading as in Week 1)

Week 3

For Monday's Class (10/12)

- Wiley AS, Allen JS. 2013. Introduction: A biocultural approach to medical anthropology. In: Medical Anthropology: A Biocultural Approach (2nd edition). New York: Oxford University Press, pp. 1-11.
- Schneider MJ. 2017. Epidemiology: The basic science of public health (Chapter 4). In: Introduction to Public Health (5th edition). Burlington, MA: Jones and Bartlett Learning. pp. 3-14. (Also read short sections from Chapters 4 & 5 included with this chapter PDF)

For Wednesday's Class (10/14)

- Leonard WR, Snodgrass JJ, and Sorensen MV. 2009. Health consequences of social and ecological adversity among indigenous Siberian populations: Biocultural and evolutionary interactions. In: Panter-Brick & Fuentes (eds.) Health, Risk, and Adversity: A New Synthesis from Biological Anthropology.

Week 4

For Monday's Class (10/19)

- Gravlee, C.C., 2020. Systemic racism, chronic health inequities, and COVID-19: A syndemic in the making? *American Journal of Human Biology*.
- Katzmarzyk, P.T., Salbaum, J.M. and Heymsfield, S.B., 2020. Obesity, noncommunicable diseases, and COVID-19: A perfect storm. *American Journal of Human Biology*.
- Gildner, T.E. and Thayer, Z.M., 2020. Maternal and child health during the COVID-19 pandemic: Contributions in the field of human biology. *American Journal of Human Biology*.

For Wednesday's Class (10/21)

- Jurmain R et al. 2011. The biological basis of life (Chapter 3). In: Essentials of Physical Anthropology, Cengage. pp. 48-69.

Lab Reading's for Week 4

- Ball HL, Russell CK. 2014. SIDS and infant sleep ecology. *Evolution, Medicine, and Public Health* 2014(1): 146.
- Lewis, N. (2020). Why Coming Up With Effective Interventions To Address COVID-19 Is So Hard. *FiveThirtyEight*. <https://fivethirtyeight.com/features/why-coming-up-with-effective-interventions-to-address-covid-19-is-so-hard/>
- Video: Autumn Schafer IntroDUCtion video: Health Promotion
https://www.youtube.com/watch?v=XgDgSXlFLil&list=PL9mmMea1Vv2IsH2Ss7E8UU5Wr74gY_XsP&index=25&t=128s

Week 5

For Monday's Class (10/26)

- Stanford C et al. 2008. The forces of evolution and the formation of species (Chapter 5). Pearson. pp. 89-98 (Note: You do not need to read pp. 99-111).
- Gluckman P, Hanson M. 2006. Where have we come from? (Chapter 2). In: Mismatch: The Lifestyle Diseases Timebomb. Oxford University Press. pp. 49-73.

For Wednesday's Class (10/28)

- Gluckman P et al. 2016. Human evolution and the origins of human diversity (Chapter 6). In: Principles of Evolutionary Medicine (second edition). Oxford University Press. pp. 131-158.

Lab Reading for Week 5

- Video: *Ghost in Your Genes*; no readings

Week 6

For Monday's Class (11/2)

- Jurmain R et al. 2011. Human variation and adaptation (Chapter 12). In: Essentials of Physical Anthropology, Cengage. pp. 302-335.

For Wednesday's Class (11/4)

- Relethford JH. 2010. The biological impact of agriculture and civilization (Chapter 17). In: The Human Species: An Introduction to Biological Anthropology. McGraw-Hill. pp. 430-458.

Lab Reading for Week 6

- Video: Kristen Yarris IntroDUCKtion video: Social Determinants of U.S. racial/ethnic disparities in coronavirus. https://www.youtube.com/watch?v=92SQ-_Od91I

Week 7

For Monday's Class (11/9)

- Schneider MJ. 2017. Prologue: Public health in the news. In: Introduction to Public Health (5th edition). Burlington, MA: Jones and Bartlett Learning. pp. xv-xxx.
- Schneider MJ. 2017. Public health: Science, politics, and prevention (Chapter 1). In: Introduction to Public Health (5th edition). Burlington, MA: Jones and Bartlett Learning. pp. 3-14. (Also read short sections from Chapters 4 & 5 included with this chapter PDF)

For Wednesday's Class (11/11)

- Sapolsky RM. 2018. The health-wealth gap: The growing gulf between rich and poor inflicts biological damage on bodies and brains. *Scientific American*.
- Kivland C. & Sosin A. 2018. Why climate change is worsening public health problems. *The Conversation*. <https://theconversation.com/why-climate-change-is-worsening-public-health-problems-86193>

Week 8

For Monday's Class (11/16)

- *Rx for Survival* video; no readings

For Wednesday's Class (11/18)

- Zuk M. 2007. Friendly worms and the price of victory (Chapter 2). In: Riddled with Life: Friendly Worms, Ladybug Sex, and the Parasites that Make Us Who We Are. Harcourt Press. pp. 38-63.
- Stearns SC, Medzhitov R. 2016. Mismatch (Chapter 8). In: Evolutionary Medicine. Sinauer. pp. 233-237 ONLY.
- Gildner, T.E., 2020. Links between metabolic syndrome and the microbiome. *Evolution, Medicine, and Public Health*, 2020(1), pp.45-46. <https://theconversation.com/why-climate-change-is-worsening-public-health-problems-86193>

Lab Reading for Week 8

- Jong-Fast M. 2020. I am not a brave person. I am also Patient 1133. *The New York Times*, 9/17/20.
- Koerth M. 2020. How to know when you can trust a COVID-19 vaccine. *FiveThirtyEight*, 9/23/20.
- Khullar D. 2020. It will take more than a vaccine to beat COVID-19. *The New Yorker*, 9/8/20.

Week 9

For Monday's Class (11/23)

- Zuk M. 2007. Bad but Not Weird: The Real Emerging Diseases (Chapter 10). In: Riddled with Life: Friendly Worms, Ladybug Sex, and the Parasites that Make Us Who We Are. Harcourt Press. pp. 38-63.
- Mandavilli A. (2020). "The biggest monster" is spreading: and it's not the coronavirus. *The New York Times*. <https://www.nytimes.com/2020/08/03/health/coronavirus-tuberculosis-aids-malaria.html?action=click&module=Top%20Stories&pgtype=Homepage>

For Wednesday's Class (11/25)

- Zuk M. 2007. When Sex Makes You Sick (Chapter 5). In: Riddled with Life: Friendly Worms, Ladybug Sex, and the Parasites that Make Us Who We Are. Harcourt Press. pp. 38-63.
- Perlman R. 2013. Sexually transmitted diseases (Chapter 8). In: Evolution and Medicine. Oxford University Press, pp. 91-102.

Week 10

For Monday's Class (11/30)

- Yong E. 2020. America is trapped in a pandemic spiral. *The Atlantic*, 9/9/20.
- Christ M. 2020. Opinion: What the Coronavirus Means for Climate Change. *New York Times*.

For Wednesday's Class (12/2)

- No new readings