

Advanced Evolutionary Medicine (ANTH 459/559)

Class Time: Tuesdays & Thursdays from 3pm to 4:50pm

Class Location: 204 Condon

Instructor: Dr. Kirstin Sterner

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Office: 352 Condon Hall

Office Hours: 9:30am to 11:30am on Thursdays & by appointment

Prerequisites

Students should have successfully completed one or more of the following prerequisites prior to enrolling in this course: ANTH 175 (**strongly suggested**), ANTH 270, ANTH 468, or comparable courses in the Biology Department (BI 131 or 380).

Course Description

This course will explore current research in the field of evolutionary medicine.

Extended Course Description

This course will explore current research in evolutionary (or Darwinian) medicine. Evolutionary medicine provides insights into *why* diseases occur at all by examining how natural selection and other evolutionary forces have shaped our susceptibility to disease. Each week we will explore a new topic that intersects health/medicine and evolutionary theory (e.g., host-pathogen co-evolution, infectious diseases, complex diseases, chronic diseases, aging, diet and nutrition). The course will focus particular attention on the role genetic and environmental factors play in the development and progression of human diseases.

This course has three main sections:

Section 1: This course begins with a three-week section that introduces students to key concepts and methods used in evolutionary medicine. During this section we will also establish a scientific framework through which students will be expected to interpret and assess the material and readings presented during the term. **The ultimate objective of this section is for students to build a foundation from which to critically evaluate research in evolutionary medicine.**

Section 2: The second section of the course will focus on infectious diseases (i.e., diseases caused by pathogens; communicable diseases). We will discuss how evolutionary processes of both the host and pathogen influence host disease outcomes and the effectiveness of treatment strategies. We will then target our discussion to specific infectious diseases (e.g., HIV, malaria and influenza) that currently afflict human populations. **The ultimate objective of this section is for students to gain a more complete understanding of how evolutionary processes shape our susceptibility to various infectious diseases and to learn how to critically evaluate research in this field.**

Section 3: During the final section of this course we focus on noninfectious diseases (i.e., chronic diseases that are not passed from person to person and are heavily influenced by genetic and lifestyle factors). Each week we will explore a different type of chronic disease (e.g., autoimmune diseases,

mental health disorders, metabolic disorders etc.), focusing specifically on how evolutionary processes influence their prevalence and outcomes in modern human populations. **The ultimate objective of this section is for students to gain a more complete understanding of how evolutionary processes shape our susceptibility to chronic diseases and to learn how to critically evaluate research in this field.**

This course will provide students the opportunity to critically evaluate and discuss current research in evolutionary medicine by engaging with primary literature in the field. This course is **not** meant to serve as an introduction to evolutionary medicine.

Student Learning Objectives

By the end of this course students will be able to:

1. define key concepts in evolutionary theory as they apply to health and disease
2. outline how to test if a trait or disease is adaptive (i.e., shaped by natural selection)
3. read and present data from peer-reviewed, primary literature
4. critically evaluate claims of adaptation in the press and primary literature
5. explain how evolutionary processes have shaped our susceptibilities to disease

Course Format

Lecture and directed discussion with some group presentations.

Required Readings

All readings will be available online (Canvas). Readings should be completed before arriving to class on the day they are scheduled under. Students should be prepared to discuss the readings.

Classroom Etiquette

Help make this an intellectually safe and friendly environment by respecting others in the class. Along these lines, please:

- arrive for class on time and read all articles before the start of each class.
- do not interrupt someone speaking in class.
- silence or turn off your cell phone during class.
- never text, instant message or surf the web during class. **In addition to being disrespectful and distracting, it will cost you your participation credit for the day.**
- never record (audio or video) any part of the lectures or discussions unless you have my permission.

Evaluation Criteria

Participation in class discussion is required and very important for your grade in this course. Please read the **Tips for Success** Page on Canvas for advice on how to get the most out of this course. If you are having trouble, come to my office hours or talk to me after class.

Grades

See **Grading Statement** (below) for an explanation of what each letter grade requires. Grades will reflect the following: participation in class discussions; submission of weekly discussion questions; group presentation; and performance on a research paper (topic, outline and final paper).

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| Class Participation | 20% |
| Discussion Questions | 16% |
| Group Presentation & Discussion | 25% |
| Research Paper Topic | 04% |
| Research Paper Outline | 15% |
| Final Research Paper | 20% |

Class Participation

Participation is an important part of this course and this is recognized by assigning 20% of the total grade to class participation. Students are expected to attend class and contribute to all in-class discussions. In order to facilitate participation there will be small group discussions in addition to whole class discussions. Participation will be evaluated based on attendance and the consistency and quality of student contributions to in-class activities and discussions (full credit = 1 point per class).

Discussion Questions

Students are required to submit at least three discussion questions per week related to the reading material from that Thursday. **Discussion questions should be completed before class (typed and printed – there will be no credit given for handwritten questions) and are due on Thursdays unless otherwise noted.** These questions will help direct our discussions and tailor the material to the specific interests of the class. The best questions are often the ones that link course material and bridge readings with outside information. Write thought-provoking questions that show you have not only read the material but have synthesized its content to receive full credit for these assignments. Instructions will be given in the first lecture.

Student Presentations and Student-Led Discussion

Beginning in week 4, each student will be required to present an article related to that week’s topic. Undergraduates will work in small groups, while graduate students will work independently. **Each group is responsible for emailing me 3 articles of interest and a brief (one paragraph) justification for each article a week in advance.** The presentation grade will be based both on how well the article is presented and on how well the student(s) facilitates class discussion following the presentation. If working in a group, all group members are required to contribute and participate in both the presentation and discussion. See the **Instructions for Your Presentation and Student-Led Discussion** for more information.

Research Paper

The final research paper will be 10 pages (double-spaced; undergraduates). The specific topic of the paper is the choice of the student, provided it is appropriate for the class and follows the guidelines outlined in the **Research Paper Guidelines** handout. **The research paper topic is due by week 3 and the outline is due by week 8 (undergraduates only).** Instructions for the outline will be given in class. **The paper outline and final paper should be printed out and turned in (not emailed).**

Appropriate accommodations will be provided for students with documented disabilities. If you have a documented disability and anticipate needing accommodations in this course, please make arrangements to meet with me as soon as possible. Please bring a notification letter from Disability Services outlining your approved accommodations.

Grading Statement

Undergraduate grades will be assigned as follows: A = 90-100%, B = 80-89%, C = 70-79%, D = 60-69%, F < 60% (with minus and plus grades assigned at appropriate cutoffs). Graduate students need to earn a B- or higher to receive credit for this course.

- A+ Quality of student's performance significantly exceeds that of an A. Very few, if any, students receive this grade in a given course.
- A Outstanding performance relative to that required to meet course requirements; demonstrates both mastery of course content & coursework quality at the highest level.
- B Performance that is significantly above that required to meet course requirements; demonstrates both mastery of course content & coursework quality at a high level.
- C Performance that meets the course requirements in every respect; demonstrates adequate understanding of course content and coursework quality.
- D Performance that is at the minimal level necessary to pass the course but does not fully meet the course requirements; demonstrates marginal understanding of course content and coursework quality.
- F Performance in the course, for whatever reason, is unacceptable and does not meet the course requirements; demonstrates inadequate understanding of the course content and coursework quality.

Course Schedule and Assignments

| Week | Date | Topic |
|------|----------------------|---|
| 1 | Apr 3 rd | Course Introduction and Overview of Evolutionary Medicine |
| | Apr 5 th | Testing Evolutionary Hypotheses about Disease (The Basics) <u>Discussion Questions Due</u> |
| 2 | Apr 10 th | Studying the Immune System |
| | Apr 12 th | <u>No Class</u> (<i>AAPA Annual Meeting in Atlanta, GA</i>) Use this time to review Apr 5 th lecture and choose a paper topic. |
| 3 | Apr 17 th | Genetic Variation & Disease |
| | Apr 19 th | Developmental Plasticity <u>Paper Topics Due via Canvas</u> <u>Discussion Questions Due</u> |
| 4 | Apr 24 th | Infectious Diseases; Host-Pathogen Co-Evolution |
| | Apr 26 th | Infectious Diseases Student Presentation and Discussion <u>Discussion Questions Due</u> |

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| 5 | May 1 st | Infectious Diseases; Case Study: HIV/AIDS |
| | May 3 rd | Infectious Diseases Student Presentation and Discussion <u>Discussion Questions Due</u> |
| 6 | May 8 th | Allergies & Autoimmune Diseases |
| | May 10 th | Allergies & Autoimmune Diseases Student Presentation and Discussion <u>Discussion Questions Due</u> |
| 7 | May 15 th | Mental Health Disorders |
| | May 17 th | Testing Evolutionary Hypotheses about Disease (Workshop) |
| 8 | May 22 nd | Depression & Stress <u>Research Paper Outline Due</u> |
| | May 24 th | Depression & Stress Student Presentation and Discussion <u>Discussion Questions Due</u> |
| 9 | May 29 th | Evolution of the Human Diet |
| | May 31 st | Aging/Senescence <u>Discussion Questions Due</u> |
| 10 | Jun 5 th | Testing Evolutionary Hypotheses about Disease (Wrap Up Discussion) <u>Research Paper Due</u> |
| | Jun 7 th | Evolutionary Medicine in the Doctor's Office <u>Discussion Questions Due</u> |