

Evolution, Disease, and Medicine**11:216:110****Fall 2022**

Asynchronous Remote only (but content released on Monday/Thursday schedule)

Instructor: Siobain Duffy
duffy@sebs.rutgers.edu
<https://rutgers.webex.com/meet/siobain>

Virtual Office Hours:

Monday 3-5pm

Course Website: On Canvas

Resources, announcements and **changes to this syllabus** will be posted on this canvas page, so please let us know if you do not have access or do not receive announcements. Canvas tends to use your Rutgers email address, so make sure you have checked that.

Lecture materials, additional resources and quizzes/exams will be posted at 9:00am on Monday or Thursday (as observed by Rutgers scheduling).

Homeworks will be posted at 9:00am one week ahead of the due date. All assignments (quizzes, homeworks, exams) are due at 11:59PM on the last day they are posted.

Course content: This course is designed to introduce students to the theory of evolution and its real-world applications to the practice of medicine. Concepts of evolutionary fitness, co-evolution, competition, natural selection, bottleneck effects, adaptation, exaptation and historical constraint will be introduced and discussed in the context of disease and disease treatment. The course will cover infectious and non-infectious diseases.

Learning Goals:

1. Students will be able to define and discuss concepts of evolutionary fitness as survival and reproduction, heritability with variation as the mechanism for adaptation, and both selection and non-selection-based mechanisms of evolution.
2. Students will be able to analyze disease and disease-related healthcare concepts from human medicine as evolutionary pressures.
3. Students will be able to logically evaluate medical treatment strategies within the context of evolved responses and altered selective pressures.

Prerequisites: None

Optional Texts:

Why We Get Sick: The New Science of Darwinian Medicine
Randolph M. Nesse, George Christopher Williams (1996) Knopf Doubleday
Any edition is acceptable. It is widely available in electronic, used & new forms.

This textbook is not necessary for the course, but is helpful at explaining the concepts of the first three modules in other words. No questions on the exams will be exclusively based on the textbook. Readings from WWGS listed in the syllabus should be completed **before** watching the lecture for which they are assigned.

Additional resources are listed for many lectures, these are suggested readings/activities to be done **before** the lecture.

Evaluation and Grading:

Twenty post-lecture quizzes, each worth 1% of the grade. Three lowest quiz scores erased (turned into full credit) at end of the semester
Quizzes available from 9:00am on day of a lecture until 11:59pm two days later (each quiz is available for 63 hours)
Four homework assignments in lieu of a lecture, each worth 5% of the grade
Due before 11:59pm on the listed day on the syllabus
Four exams, each worth 20%, lowest exam score dropped
Total: 100%

Exams will be limited to 80 minutes, but you can start the exam anytime from 9:00am on the scheduled day until it closes 11:59pm the following day. Each exam will be available for 39 hours, and the latest start time allowing 80 min would be 10:39pm the following day.

No make-up exams will be given*; you can miss one for health, technology, etc reasons without suffering any consequences. No make-up quizzes will be given*; you can miss up to three for health, technology, etc reasons without suffering any consequences.

*Exceptions and accommodations will be made for serious, longer illnesses and long-term situations (talk to me and your dean), but the grading scheme is already designed to allow for life circumstances to interfere with your studying for one exam or forgetting to watch a lecture or two in a timely fashion without it affecting your final grade.

The exams are not explicitly cumulative, but the later topics build on those discussed earlier. The fourth exam will be given during the final exam period but will be of similar length as the other, in-class exams. Exams will be short and long answer questions and will have an 80 min time limit (180 min for the Exam 4, in the final exam period). All exams are open lecture/open note/open internet. You are not allowed to discuss the exam with other classmates until after the window when the exam is available is over.

Scholarly Conduct: As with all courses at Rutgers, cheating and plagiarism are strictly forbidden (see <http://academicintegrity.rutgers.edu/>). You are personally responsible for adhering to the entire policy. Violations of Rutgers' policy will result in a 0% grade for that exam/homework assignment/quiz and will be reported to the Student Conduct Office.

This syllabus is not a contract. It is the planned course outline. Items may be added, subtracted, or changed at the discretion of the professor. The on-line version of the syllabus takes precedence over any printed copies.

Student Wellness Services

School and life (especially in a pandemic) can get stressful, and Rutgers has many ways to get help. I can offer a Safer Space and help you connect to these resources, but as an instructor I have a mandatory duty to report some issues and concerns to the appropriate offices at the University. I can offer you privacy and discretion, but not confidentiality.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 <http://health.rutgers.edu/medical-counseling-services/counseling/>
CAPS is a university mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 <http://vpva.rutgers.edu/>
The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling, and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To talk to someone 24/7, call 848-932-1181.

Rutgers Student Food Pantry

848-932-5500 <http://ruoffcampus.rutgers.edu/food/>
Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. Furthermore, please talk to me if you are comfortable in doing so. A 2018 survey found that 1/3 of all students at Rutgers have experienced food insecurity at some point during the semester. You are not alone and we are here to help.

Disability Services

(848) 202-3111 <https://ods.rutgers.edu/>
Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway
Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide

documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/getting-registered>

Th 9/8 Introduction to the course

Module 1: Disease and Human Evolution

M 9/12 Class video: Your Inner Monkey (PBS video, 55min)

<https://video-alexanderstreet-com.proxy.libraries.rutgers.edu/watch/your-inner-monkey>

Th 9/15 Standing Tall

<http://humanorigins.si.edu/evidence/human-family-tree>

<https://www.thepodcastbrowser.com/the-obstetrical-dilemma/> (34min podcast)

M 9/19 Out of Africa

<https://legacy.calacademy.org/human-odyssey/map/>

Th 9/22 Culture Club

M 9/26 Say you want a (agricultural? industrial?) revolution...
WWGS 143 - 157 (Diseases of Civilization)

Th 9/29 Homework 1 due (before 11:59pm)

M 10/3 Exam 1

Module 2: Evolution and non-infectious disease

Th 10/6 It runs in the family

Genetics refresher: read topics of interest on

<http://learn.genetics.utah.edu/content/basics/>

M 10/10 Why Bad Things Happen to Good People

WWGS 13-25 (Natural Selection), 91-106 (Genes and Disease),
123-142 (Life History evolution)

Th 10/13 Why We Get Old and Fat

WWGS 107-122 (Aging), 143-157 (Diseases of Civilization)

M 10/17 Why We Overreact

WWGS 158-170 (Allergy), 207-221 (Mental Disorders)

Th 10/20 Cancer

WWGS 171-181 (Cancer)

M 10/24 Homework 2 due (before 11:59pm)

Th 10/27 Exam 2

Module 3: Evolution and infectious disease

M 10/31 Class video: Spillover: Zika, Ebola, and Beyond (PBS video, 56min)

<https://video-alexanderstreet-com.proxy.libraries.rutgers.edu/watch/spillover-zika-ebola-and-beyond>

Th 11/3 We're all connected

WWGS 49-65 (An Arms Race Without End)

M 11/7 Viruses!

<https://www.cdc.gov/flu/pandemic-resources/index.htm>

Th 11/10 The Deadliest Animal?

<https://health2016.globalchange.gov/vectorborne-diseases>

(this is long and detailed, please look at [least at] the key findings)

M 11/14 Rise of the superbugs
<https://www.brainpop.com/games/antibioticresistancegame/>

Th 11/17 Homework 3 (before 11:59pm)

M 11/21 Exam 3

Module 4: Applications of evolutionary medicine

T 11/22 Vaccines and global public health
<https://www.quantamagazine.org/how-vaccines-can-drive-pathogens-to-evolve-20180510/>

M 11/28 I Contain Multitudes: the Human Microbiome
<https://microbiomedigest.com/our-bodies-best-buddies/>
<http://learn.genetics.utah.edu/content/microbiome/ecosystem/>

Th 12/1 Using evolution against our diseases
<https://www.statnews.com/2016/12/07/virus-bacteria-phage-therapy/>

M 12/5 Precision Medicine
<http://www.nature.com/nature/journal/v452/n7189/full/452819a.html>
<http://learn.genetics.utah.edu/content/precision/intro/>
<https://www.whitehouse.gov/precision-medicine>

Th 12/8 Race-based medicine, misapplications of evolutionary medicine
<http://www.npr.org/sections/health-shots/2016/02/05/465616472/is-it-time-to-stop-using-race-in-medical-research>

M 12/12 Homework 4 (before 11:59pm)

TBD Exam 4
(not explicitly cumulative, on 4th module, and of similar length to the other three exams, but you will be allowed 180 minutes)