Brown-Pfizer Master's of Arts Program

AM in Biology

Elizabeth O. Harrington, PhD, Associate Dean of Biology Graduate Education

November 22nd, 2024

BROWN
Division of Biology
and Medicine

Agenda

- Program overview and goals
- Spring 2025 course overview
  - *Planetary Health: Global Environmental Change and Emerging Infectious Disease*
- Fall 2025 course overview
  - *Molecular Targets of Drug Discovery*

Historical Summary of Partnership

- The Brown-Pfizer Master of Arts program was approved by the Executive Committee of the Program in Biology of the Division of Biology & Medicine by a resolution on October 12th, 1993.
- This was a contractual agreement between Pfizer and Brown University to provide programming on the Groton, CT campus for employees and/or contract employees to take classes towards an AM in Biology.
- Brown University was accredited for the program by the Office of Higher Education by the State of Connecticut for the New England Association of Schools and Colleges.

Current Programming

Program Requirements

- 8 graduate level courses
  - 2 courses must be within the core subjects
    - Cell biology
    - Biochemistry
    - Genetics
    - Pharmacology
  - The grade earned of 6 of the courses must be at least a ‘B’
- Capstone project

Current Programming

Program Requirements

- All courses are delivered online
- 1 course is offered per semester (fall and spring)
  - No course credits may be transferred.
  - Must be actively employed @ Pfizer.
  - Students have the option to take courses on campus with approval from Assoc Dean and course Instructor.

Current Programming

Program Requirements

- After the successful completion of 2 courses (B or better), students apply to the program.
- Application
  - Undergraduate transcript
  - Letter of recommendation from supervisor
  - Short statement of interest
- Once accepted, students must enroll each semester
  - One leave of absence (LOA) may be taken

Current Programming

Program Requirements

- Capstone project: Apply critical scientific thinking, experimental design, and knowledge integration by formulating a capstone project that showcases rigorous analysis and original insights.
- Options:
  - Final paper
  - Research proposal
- Each are 10-15 pages long
- Topics and an outline needs prior approval
- Due after the completion of 7 courses, and no later than 1 semester after completing the 8th course.

Current Programming

Program Outcomes

- Since 1991, 2747 students have enrolled in the 72 courses offered in the Brown-Pfizer program (83.2±48.6 enrollees/ academic year).
- Since 1995, 203 individuals have obtained their AM through this program (6.8±4.5 graduates/ academic year).
- Of the graduates, 8 individuals have gone on to obtain a subsequent PhD, while most graduates remain in industry/ pharmaceutical type positions.

Current Programming

Student Feedback

- All students (n=6) who participated in a recent discussion of the program had received bachelor's degrees in a scientific field.
- They rated the course offerings, academic rigor, and faculty instructors as excellent.
- They felt that the program was well designed for working professionals and provided excellent programming in which it afforded professional and academic growth and knowledge and in-depth discussion of primary literature allowing them to develop a better understanding of the scientific research they were involved with and confidence in their respective work environments.

Current Programming

Student Feedback

- Overall the students rated the program valuable because
  - courses were challenging;
  - assisted them to determine the type of scientific path they wanted to pursue further;
  - was beneficial to their workplace understanding, participation in discussion, and performance; and
  - fostered career growth and opportunities.

Program Contacts

- Brown University contact:
  - Isaac Bryden: Isaac_Bryden@brown.edu
  - Tracey Cronin (through mid-January): Tracey_Cronin@brown.edu
- Pfizer contact:
  - Kari Donahue: Katharine_donahue@Pfizer.com

Program Tuition

- Electronic ACH Payment - Students and their Authorized Users can access the E-Bill & Payment system at http://payment.brown.edu to make online ACH payments via a U.S. personal checking or savings account. Electronic ACH payments will post to the student’s account immediately and may take up to 48 business hours to post against the payer's bank account.

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BIOL 2455 Planetary Health: Global Environmental Change and Emerging Infectious Disease

Spring 2025
Online, asynchronous

Kate Smith PhD
Associate Professor of Medical Science
Senior Associate Dean of Biology for Education
Co-Director of Planetary Health

katherine_smith@brown.edu

The ROCKEFELLER FOUNDATION

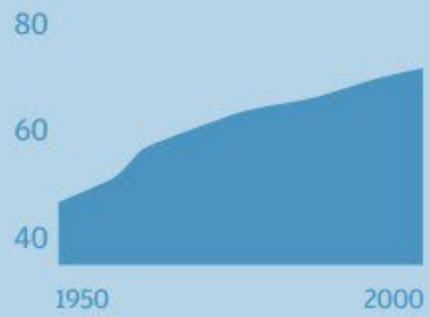
THE LANCET

Planetary Health is a field focused on characterizing the human health impacts of human-caused disruptions of Earth's natural systems

THE HUMAN POPULATION IS HEALTHIER THAN EVER BEFORE

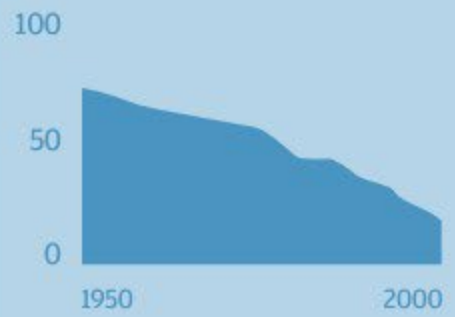
LIFE EXPECTANCY

Mean global life expectancy at birth (years)



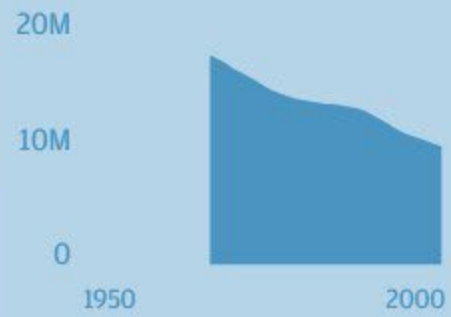
POVERTY

Population of world in poverty (%)



CHILD MORTALITY

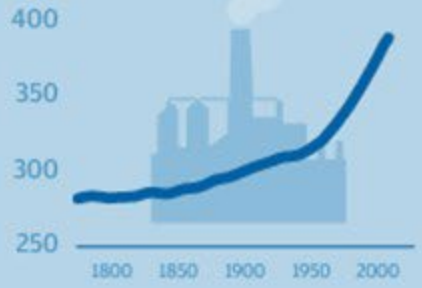
Recorded deaths of under-fives[1]



BUT TO ACHIEVE THIS WE'VE EXPLOITED THE PLANET AT AN UNPRECEDENTED RATE

CARBON DIOXIDE EMISSIONS

Atmospheric concentration of CO_2 (ppm)

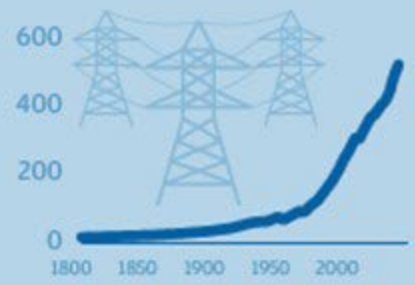


OCEAN ACIDIFICATION

Global ocean acidification (mean hydrogen ion concentration, nmol/kg)

ENERGY USE

World primary energy use (EJ)

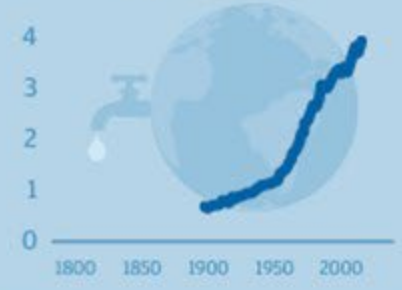


TROPICAL FOREST LOSS

Global tropical forest loss compared with 1700 baseline (%)

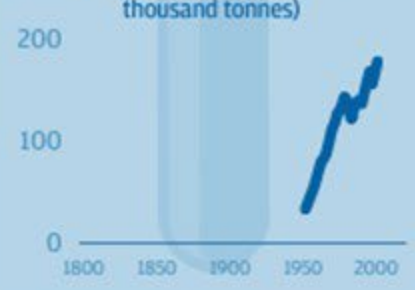
WATER USE

Water use (thousand km^3)



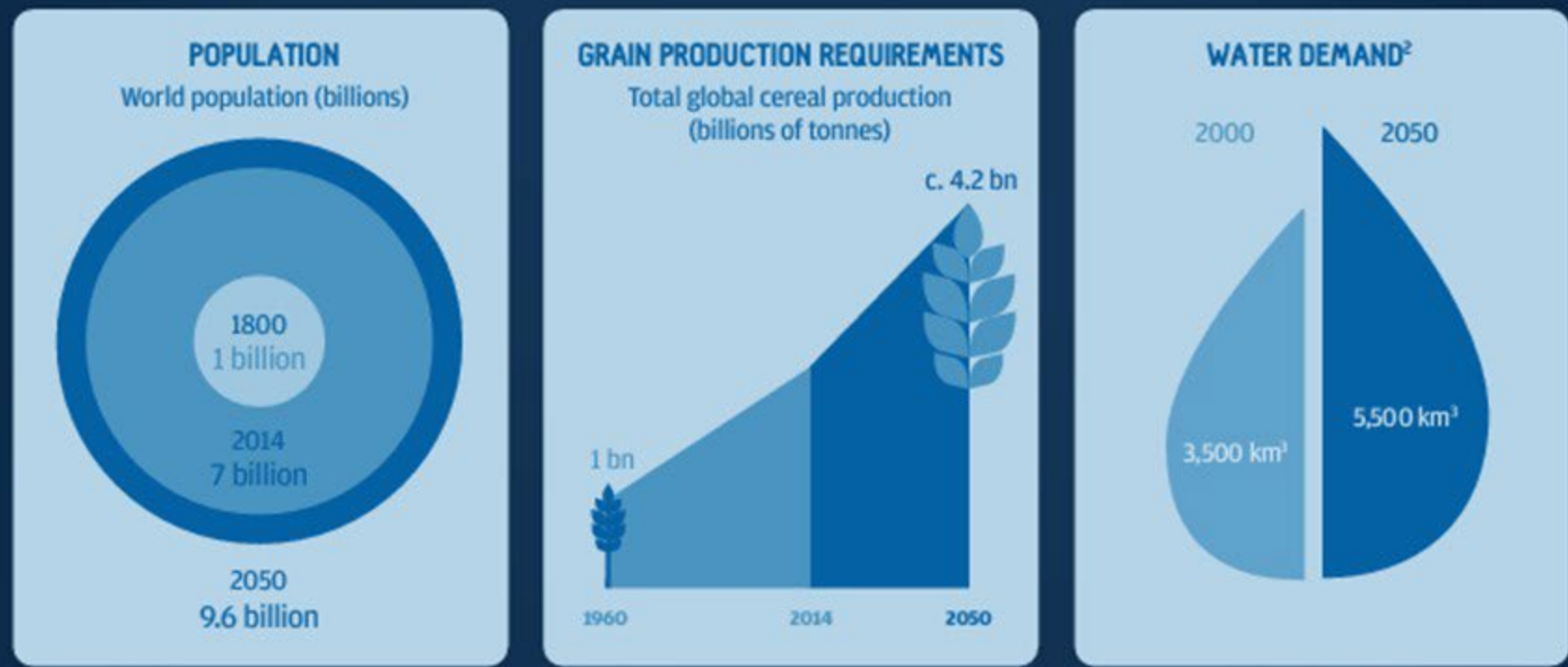
FERTILISER USE

Global fertiliser use (nitrogen, phosphorus, and potassium; thousand tonnes)



The period of environmental changes induced by human exploitation of the planet defines a new geological era: the Anthropocene epoch

ON OUR CURRENT TRAJECTORY WE WILL PUT EVEN MORE PRESSURE ON THE PLANET



DAMAGING THE PLANET DAMAGES HUMAN HEALTH

If unchecked climate change related impacts could cause an extra

250,000

deaths per year

between 2030 and 2050[3]

Overfishing together with increasing acidity and other environmental changes threaten fish supplies

Millions of people are at risk of under nutrition due to the combined effects of

climate change and other environmental changes

By 2050 over

40%

of the world's population could be living in areas under severe water stress

This leads to a loss of

1-2

million hectares of agricultural land per annum

Planetary health is a scientific field and global movement focused on understanding and quantifying the growing human health impacts of anthropogenic global environmental change, and developing solutions that will allow humanity and the natural systems we depend on to thrive now and in the future.

PLANETARY HEALTH ALLIANCE

Global rise in human infectious disease outbreaks

Katherine F. Smith[1,†], Michael Goldberg[1], Samantha Rosenthal[2], Lynn Carlson[3], Jane Chen[1], Cici Chen[4,†] and Sohini Ramachandran[1,5,†]

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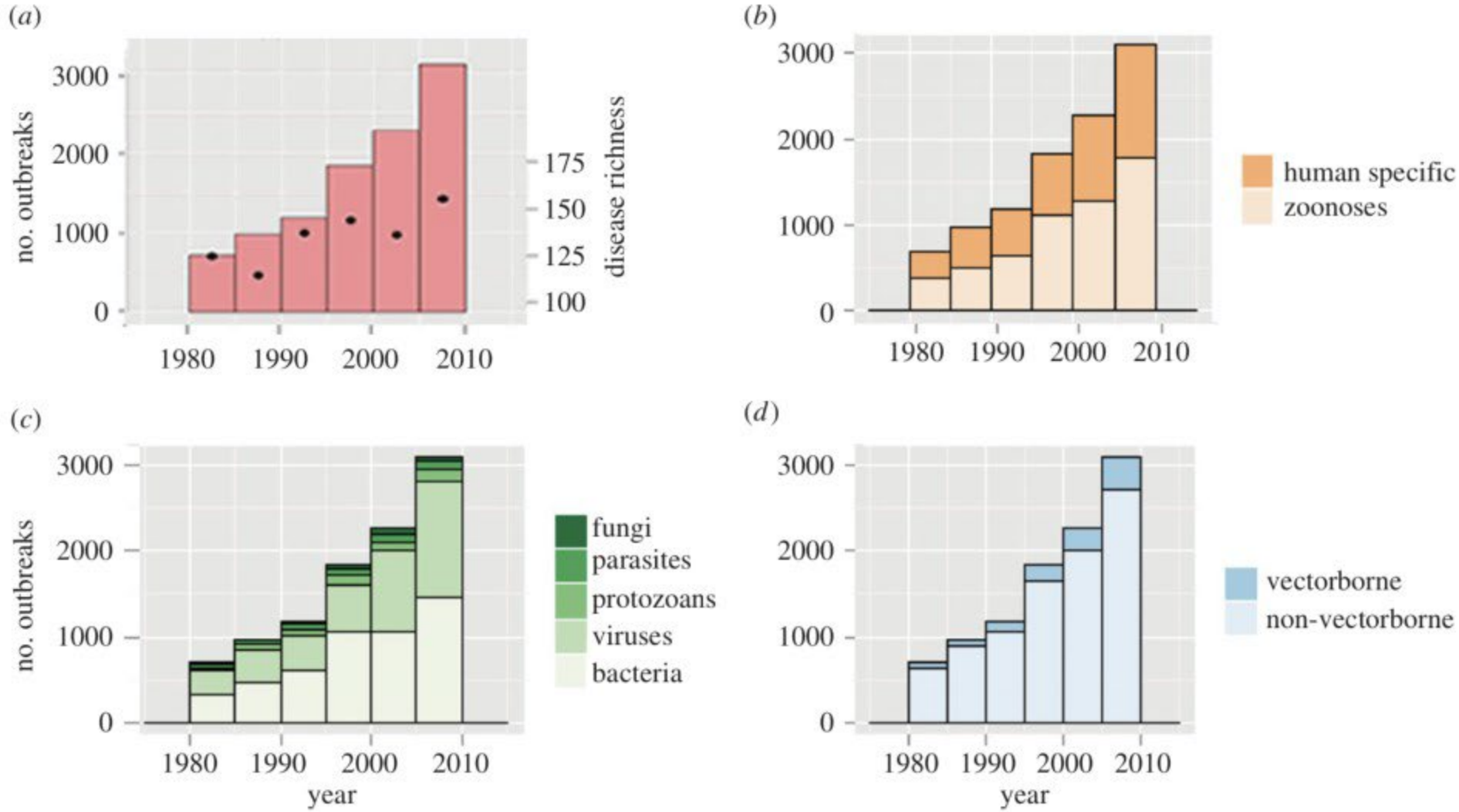


BIOL 2455 Planetary Health: Global Environmental Change and Emerging Infectious Disease

Spring 2025

Will a warmer world be a sicker world? What is it about the New England landscape that supports the proliferation of Lyme Disease? How are local wildlife trade and global species invasions contributors to emerging diseases like the 2003 outbreak of monkeypox virus in the USA?

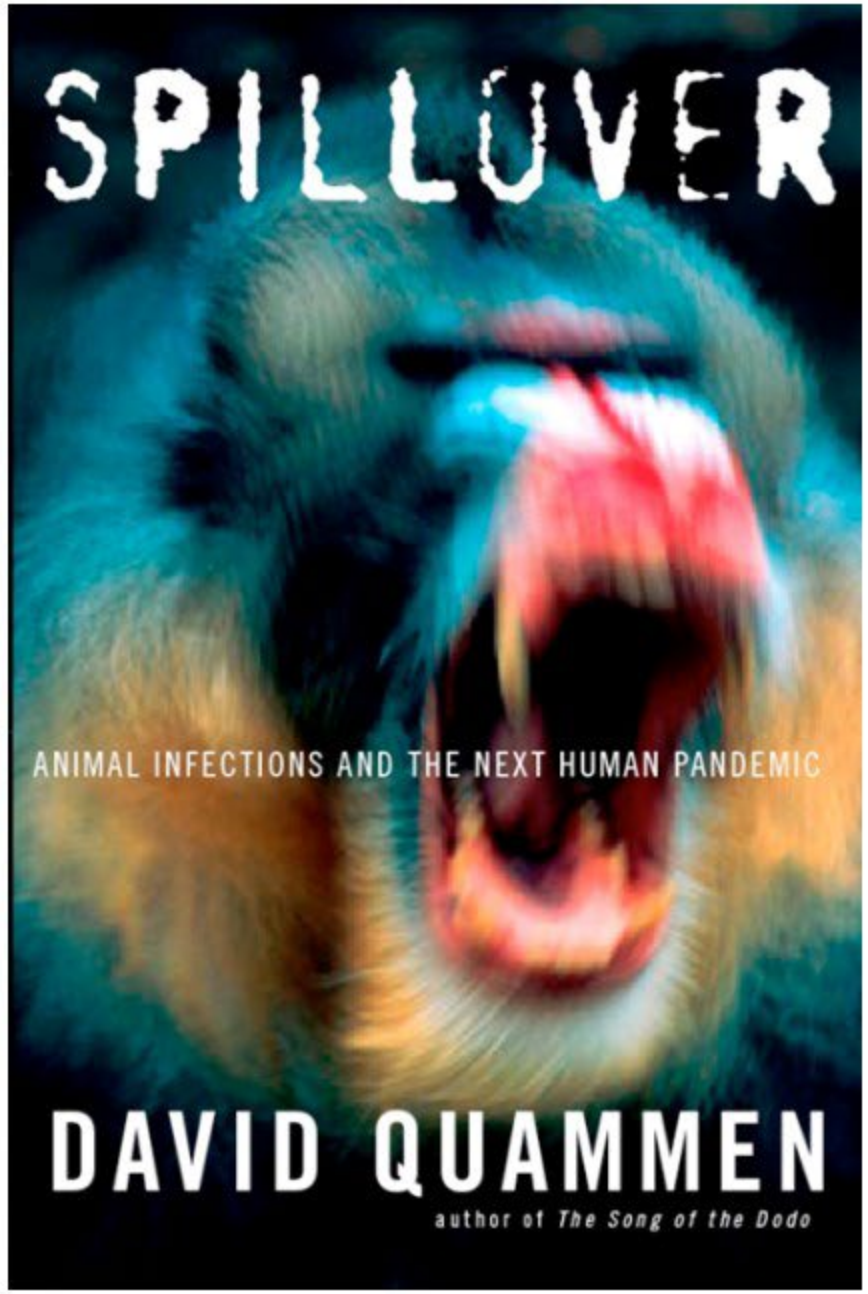
BIOL 2455 Planetary Health: Global Environmental Change and Emerging Infectious Disease
Spring 2025

Will a warmer world be a sicker world? What is it about the New England landscape that supports the proliferation of Lyme Disease? How are local wildlife trade and global species invasions contributors to emerging diseases like the 2003 outbreak of monkeypox virus in the USA?

Aim: Students will learn how, when, where and why infectious diseases emerge in association with anthropogenic environmental impacts, specifically climate change, land-use change, and increased human interaction with animals.

Modality & Pace:

- Fully online asynchronous course in Canvas. Designed so students can generally work at their own pace.
- 5 modules, each lasting ~11 academic/business days:
  - Module 1 introduces students to the field of Planetary Health and rise of emerging infectious diseases. Modules 2-4 dive deeply into the connection between a specific environmental change (invasive species, land-use change, and climate change) and disease emergence. Module 5 focuses on pandemics - considering the origins of covid-19 and the future of pandemic preparedness.
- Each module has virtual discussions for students to interact with one another on content. There will be an optional zoom meeting at the start of each module to set the stage for the material. Regular zoom drop ins will also be available to answer questions and talk about material.



Assessments:

Each module: quizzes, reflections, contribution to virtual discussions

<u>Two larger projects:</u>

Project 1. Reading and an assignment based on *Spillover: Animal Infections and the Next Human Pandemic* by David Quammen.

Project 2. Op-ed on any topic of your choosing for an audience of your choosing. *Does not need to be focused on infectious disease.*

Learning Outcomes

Students who successfully complete this course will be able to:

- Define Planetary Health, provide examples of the kinds of topics the field focuses on, and explain its importance.
- Describe a list of patient-planetary health co-benefits.
- Define emerging infectious disease and describe the global increase and geographic distribution of emerging infectious diseases in the human population over the last century.
- Draw on evidence-based examples to describe how climate change, land-use change, and species invasion/animal trade can lead to the emergence of infectious disease in humans and wildlife.
- Explain, using examples, how and why the environmental and emerging disease impacts of our changing planet are not distributed evenly across populations and geographies.
- Assemble and critique a list of actions that can help to prevent infectious disease emergence resulting from environmental change.
- Research and develop an evidence-based opinion article on a Planetary Health topic of choice.
- Draw on peer-reviewed evidence and investigative works to construct and defend an argument in support of covid-19's origin being nature or the lab setting.

Hope to see you in spring!

katherine_smith@brown.edu

Molecular Targets of Drug Discovery
Preview for Fall 2025

Diana Horrigan, PhD
Senior Lecturer, Biology, Department of Pathology and Laboratory Medicine
Co-Director, Therapeutic Sciences Graduate Program

Diana Horrigan

- Assumption College, BA in Biology, 2001
- Brown University, Ph.D. in Biomedical Sciences (Molecular Pharmacology & Physiology), 2006
- Began teaching at Brown in 2011
  - Senior Lecturer, Biology
  - Co-Director, Therapeutic Sciences PhD Program

Courses I currently teach at Brown:

- BIOL 2250 Survey of Modern Therapeutics (Fall)
  - Graduate students only (MA & PhD, requirement of TSGP PhD Program)
- BIOL 1100 Cell Physiology and Biophysics (Fall)
  - Mainly undergraduate/few graduate students
- BIOL 2170 Molecular Pharmacology & Physiology (Spring)
  - Graduate students/senior undergrads
- **BIOL 2145 Molecular Targets of Drug Discovery (Spring)**
  - **Graduate students only (MA & PhD)**

Course Description

- This course focuses on the identification of drug targets and the development of novel drugs.

- A background in physiology, cell biology and/or medicinal chemistry will be helpful, but not required.

Learning Outcomes

1. Describe the methods essential for identifying a drug target

1. Analyze the advantages and disadvantages of methods and assays used in the process of drug discovery and development.

1. Describe the characteristics of specific drug targets and identify key principles that are considered in the process of drug discovery.

1. Apply the principles of drug discovery and development by designing a drug for a chosen target and giving an oral presentation in class.

Tentative Topics Covered

- Ion Channels as Targets
- G Protein-Coupled Receptors as Targets
- Intracellular Signaling Molecules as Targets
- Targets for Gene Therapy

Course Format

Time: Once per week, approximately 3 hours

Class Period Structure:

- **First 60-75 minutes:** Lecture of a particular target including its role in disease and therapies for that target/disease
- **10-15 minute break**
- **Last 60-75 minutes:** Student-led discussion of a current topic

Course Materials & Resources

- **Lectures:**
  - Lectures will be based on readings that have been assigned prior to the class period.
  - There is no required textbook. Readings will a combination of primary journal articles and review articles.

Course Materials & Resources

- **Student-led discussions:**
  - Each student will be assigned a class period to lead the discussion. Students will typically work in pairs.
  - The instructor will provide students with a topic and some readings or other resources (e.g., video, podcast, etc) to get started.
  - The discussion will begin virtually on a discussion board where all students must post prior to class.
  - Student leaders will monitor the discussion board and use responses as a starting point for the in-class discussion.

Assessments & Grading

Assessment	Weight
Bi-weekly Quiz	10% each (60% total)
Discussion Board/Student-led Discussions	10%
Participation/Attendance	5%
Group Presentation	25%

Group Presentation

- **Overview:**
  - Choose a particular molecular target and explain how/why your group would design a therapy for that particular target.

- **Format:**
  - Groups of no more than 4 students
  - 15 minute slide deck presentation
  - Components of presentation
    - Introduction
    - Design of Therapeutic
    - Assays for efficacy, safety & toxicology
    - Broad overview of clinical trial design

Student Experience