

BISC 417: Evolution and Medicine
Spring 2020
Shoemaker 516

INSTRUCTOR

Dr. Beckie Symula: Shoemaker 202; Office hours Th. 10-11am or by appointment.

REQUIRED COURSE MATERIALS

Textbooks: ***Recommended** Evolutionary Medicine*. 2016. Stearns and Medzhitov. Sinauer Associates, Inc. ISBN 978-1-60535-260-2 (Paperback).

COURSE REQUIREMENTS

Prerequisites: BISC160, BISC162, BISC336 (Genetics).

COURSE GOALS

Learning Objectives:

At the end of the semester, students will be able to:

1. Describe the fundamental principles of evolution.
2. Discriminate among evolutionary forces.
3. Explain the significance of genetic variation in humans, vectors and disease causing agents.
4. Explain how evolution influences humans.
5. Explain how evolution influences human diseases.
6. Apply principles of evolution to current literature on diseases.
7. Apply the concept of biodiversity to medicine and disease.

COURSE GRADES

Grading:

	<u>Percent</u>	<u>Date</u>
Exam 1	20	Feb. 24 (Mon.)
Exam 2	20	Apr. 6 (Mon.)
Participation	15	
Assignments	15	
Final	30	
Total	100	

Attendance and Participation: Your regular attendance is expected and will contribute to participation. 15% of your grade will come from participation. This means actively participating in class discussions and activities.

Assignments: Assignments will account for 15% of your grade. Each of you will work in a group of four and present a paper from the primary literature. Groups will present summaries of a paper and lead a discussion with the class. Before presenting the paper, groups will meet with each other and with me to help you set up the presentation. PowerPoint is not required, but I'm happy to help you build a presentation in PowerPoint. If you are not presenting the paper, you are expected to write one question that you have about the paper and one question regarding a follow-up experiment or closely related topic in Evolution and Medicine.

Exams: There will be 2 regular semester exams and a final exam, for a semester total of 70% of the grade. Exams will have multiple choice, short answer and essay questions.

Exam 1	40 points
Exam 2	40 points
Final exam	60 points

TENTATIVE LECTURE TOPICS:

Week 1	What is Evolutionary Medicine?	Gluckman et al. 2011 and Nesse & Stearns 2008 (Ch 1)
Week 2	Foundations of evolution: Variation, Molecular variation.	Futuyma Ch 9, Gluckman et al. Ch. 3
Week 3	Evolution mechanisms and principles	Futuyma and Kirkpatrick Ch 5, Hendry 2011, Hurst 2009, Nielsen et al. 2007
Week 4	What are humans? (Phylogeny)	Gregory, 2008
Week 5	What are humans? (Phylogeography) / **Exam 1 (Feb 24)** /Human genetic disease	Schraiffer and Akey, 2015
Week 6	Mismatch, Constraint and Tradeoff	Lloyd et al. 2011
Week 7	Human Life History	TBA
Week 8	Human Diet	TBA
Week 9	Pathogen Intro	TBA
Week 10	**Exam 2 (Apr 6)** /Pathogen Evolution	TBA
Week 11	Pathogen Evolution	TBA
Week 12	Geographic patterns in pathogens	TBA
Week 13	Infectious disease coevolution	TBA
Week 14	Virulence and transmissibility	TBA

Any readings outside of the required text will be provided to you on Blackboard.

RESEARCH PAPER READINGS (Have these read and prepared by the Friday of each week.):

		Topic	Reference (PDF will be provided on Blackboard.)
Jan 24	Week 1	Evolution and Public Health	Omnenn. 2010. PNAS, 10, S1:1702-1709.
Jan 31	Week 2	No paper Discussion.	
Feb 7	Week 3	Positive selection on Lactose Persistence.	Schlebusch et al. 2013. Eur. J. Hum. Genet, 21: 550-553.
Feb 14	Week 4	Using phylogeny to understand human traits.	Gomez-Robles et al. 2017. PNAS, 114:468-473.
Feb 21	Week 5	Human population evolution.	Tishkoff et al. 2009. Science, 324: 1035-1044
Feb 28	Week 6	Human tradeoff example.	Kuzawa et al. 2014, PNAS, 111:13010-13015
Mar 9	Week 7	<i>Spring Break (No Paper Discussion)</i>	
Mar 20	Week 8	TBA (Mismatch)	
<i>Student presentations</i>			
Mar 27	Week 9	Student group paper (Insecticide resistance and pathogen variation)	Chang et al. 2016, Parasites and Vectors, 9,228.
Apr 3	Week 10	Student group paper (Disease reservoirs)	LeBreton et al. 2014, 3: e7.
Apr 10	Week 11	<i>Good Friday (No Paper Discussion)</i>	
Apr 17	Week 12	Student group paper (Antibiotic resistance)	Tyerman et al. 2013, BMC Evolutionary Biology, 13: 22.
Apr 24	Week 13	Student group paper (Disease origins, virulence)	Gire et al. 2014. Science, 345: 1369-1372; Spielman et al. 2014 bioRxiv: 1-7.
May 1	Week 14	No paper Discussion.	

Final exam: Wednesday, May 9, 2018 12-3pm

COURSE POLICIES

Cell Phone/Electronics Policy: Use of cell phones, including texting, is prohibited. Please turn them off during class. You may use laptops etc. for note taking and reading course papers.

Academic Misconduct: In this course, academic misconduct applies to exams and assignments. I do not tolerate any means of Academic Misconduct and will follow the University policy on generating sanctions in any identified event of misconduct.