

DNA & Evolution

Evolution and genetics are the cornerstones of modern biology. *DNA & Evolution* will explore these fields in the context of contemporary issues that are important to individuals and societies. Although examples will be drawn from a variety of organisms, the primary emphasis will be on humans. Among the questions we will consider are these: Where did modern humans come from? Why are women and men different? Why do children resemble their parents? Do genes influence variation in personality, intelligence, and sexual orientation? What can genetic analyses reveal about evolutionary history and the relationships among species? Can genetic analyses allow us to predict the evolutionary future? Given what our society knows about evolution and genetics, should we take responsibility for guiding the evolutionary future of human populations?

Objectives

Throughout the course, the goal will be to help students develop sufficient biological sophistication to understand new discoveries in genetics and evolution, talk to their doctors, and make rational personal and political choices about biological issues. Students will read secondary and primary literature, ask questions, design experiments, analyze and interpret data, and draw their own conclusions.

Time & Place

MW 1:30 to 3:20, MGH 238

Instructor

Dr. Jon C. Herron, Senior Lecturer in Biology

Hitchcock 216B

E-mail: herronjc@uw.edu - include "DNAEvo:" in subject line

Website: <http://www.evound.com>

Office Hours: W 3:30 - 4:30 Honors Seminar Room (MGH 211B) or by appointment

Course Website

The URL for the course's Canvas website is:

<https://canvas.uw.edu/courses/1117801>

To enter the site you will need to log in with your UWNetID and password

Items posted on the website will include:

- Readings, supplementary materials, and links to other sites of interest.
- Paper assignments (These will not be distributed in class; instead they will be posted on the web at least 1 week before the paper is due).

- Homework assignments (some of these will be distributed in class, others I will ask you to get from the website).
- Information on computer labs.
- Online surveys and discussions.

Required Text and Other Readings

The required text for the course is *A Crack in Creation* by Jennifer Doudna and Samuel Sternberg. It's a fascinating look at the development and potential applications of CRISPR-Cas9 gene editing—the most powerful genetic engineering tool yet invented—by one of its inventors. It's available in hardcover, a Kindle edition from Amazon, an iBook edition from Apple, and an audiobook from Audible.

Other required readings will include draft chapters for an unpublished book. I will provide these as PDF files downloadable from the course website. (If you need a PDF reader for your computer, you can download one free from Adobe's web site at <http://acrobat.adobe.com/>. Just go to the web site and click "Adobe Reader DC". Free readers are available for mobile devices as well.)

Please note that assigned readings are intended to be completed before class. To encourage students to keep up with the reading, I may begin class with a brief, low-stakes-but-graded discussion on the day's reading.

Required Computer Labs

We will spend at least one hour of class time each week on virtual lab exercises that will allow you to design and conduct your own experiments on simulated organisms. Most are part of a commercial package from SimBio.com. We will be accessing the labs through SimBio's *SimUText* application. To receive credit for the labs, all students are required to buy a *SimUText* subscription for \$49. Instructions for how to do so are on the course web site. If you are willing and able, please bring your laptop to class on days we will be working with virtual labs.

Audience Response System

Most class sessions will include questions to answer in real time. You must be present to receive credit. For some of these, you will need a device that works with Poll Everywhere. For more information see the course website.

Students with Disabilities

If you have a disability, please speak with me about accommodations.

Assignments, Papers, and Grading

Grades for the course will be based on papers, assignments, participation in class discussions, quizzes, and an independent project.

Papers (40% of course grade)

Papers will be due on Monday of Weeks 3, 5, 7, 9, and 11. Papers must be in PDF, double spaced, on single-sided 8 1/2 by 11 inch white pages, with at least 1 inch margins. Set your main text in Times New Roman font at 11 points or larger. I will not read past the end of the second page. Papers will be graded for accuracy of content, clarity of writing, and originality of thought. More details on grading will be provided. Unless you have made a prior arrangement, late papers will penalized 1/2 grade point for every day they are late.

Assignments, participation in discussions, quizzes (40% of course grade)

For most class meetings I will give you an assignment to prepare ahead of time and/or an assignment to work on together in class. I encourage you to talk about these assignments with your classmates. Unless otherwise instructed, the actual text of written answers and design of graphs must be your own work. On the days they are due these assignments will serve as the record of your attendance in class, must be turned in person, and will not be accepted late.

The course will succeed or fail with the quality of class discussions. Please come to class prepared every day, enjoy yourself, ask questions, and give us all the chance to learn from you.

Independent project (20% of course grade)

The final assignment for the quarter will be an independent project. This will involve posing a question of your own, framing a hypothesis, and conducting a study to address it. I will provide more information, and suggestions, later in the quarter.

Honors Portfolios

A reminder from the Honors program:

Students are encouraged to archive items from this course in their Honors portfolios. Readings, lecture notes, visual materials, music, poems, syllabi, tests, papers, etc, are examples of items that might assist with reflection on learning and ways of thinking within and across disciplines. The Honors portfolios span students' undergraduate years and are best used as an ongoing, dynamic forum for the integration of knowledge. In addition to archiving items, students are also asked to take a few minutes to write-up a paragraph or two describing the significance of the archived items and how what they learned in the course contributed to their larger experiences, goals, and thoughts about education and learning.

Tentative schedule

The schedule of topics is flexible, based on your background and interests. I want to learn from you what issues in evolution and genetics are most compelling and important from your perspective. Peruse the readings, browse journals, newspapers, and the web, and let me know what you want to cover.

Week 1: Why Study Evolution and Genetics?

Understanding evolution and genetics could save your life

Week 2: Evolution 101

Where did Earth's organisms come from?
Reconstructing history, Part 1

Week 3: Adaptation and variation

What makes populations evolve?
Studying adaptation

Week 4: Human Genetics

What makes every individual unique?
Why do offspring resemble their parents?

Week 5: Genomics

Genetic modification—how, why, and should we?
What does it mean to sequence a genome?

Week 6: Evolutionary Genetics

Reconstructing history, Part 2
Genes in populations

Week 7: More Evolutionary Genetics

Predicting the evolutionary future of lab populations
Predicting the evolutionary future of populations in the real world

Week 8: Genotype and Phenotype

Do genes influence our intelligence, personality, and behavior?
Should we take responsibility for guiding our own evolutionary future?

Week 9: Human Evolutionary History

How closely related are humans and chimps?
Did humans and neanderthals ever fall in love?

Week 10: The Impact of History on Modern Humans

Why are women and men different?
What's the trouble with time travel?

Week 11: The Future

How will evolution and genetics affect the rest of your life?