

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

Section B - Tuesday/Thursday 12:30 to 2:20, Mary Gates Hall room 228

Computer Lab - Thursday 1:30 to 2:20, Mary Gates Hall room 058

Section C - Tuesday/Thursday 10:30 to 12:20, Mary Gates Hall room 228

Computer Lab - Thursday 11:30 to 12:20, Mary Gates Hall room 058

Instructor

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Office Hours: To be announced, or by appointment

Teaching Assistant

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Office Hours: Wed 10:30-12:00 in MGH 211E or by appointment in FSH 256B

Course Website

We have set up a web site for the course. The URL for the website is:

<http://web.me.com/jonherron/iweb/dnaevo10/home.html>

To enter the web site you will need a username and password. These will be announced in class. Please record them here:

Username: _____ Password: _____

Items posted on the website will include:

- Online surveys and discussions.
- 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 we will distribute in class, others we will ask you to get from the website).

Computer Labs

Each Thursday for the second hour of class we will meet in Mary Gates Hall room 058 for a computer lab. The labs will allow you to design and conduct your own experiments on simulated organisms. The majority of the lab exercises are part of a commercial package called *EvoBeaker* from SimBiotic Software. All students are required to buy a subscription to *EvoBeaker*. Instructions for how to do so are on the labs page of the course web site.

Required Text and Other Readings

The required text for the course is *The Tangled Bank* by Carl Zimmer. This is a new book by an award-winning science journalist. For more about the author, visit www.carlzimmer.com.

Supplementary readings will include draft chapters for a textbook Jon is writing called *Life 101*. We will provide these as PDF files downloadable from the course website. PDF files can be opened on any computer with Adobe Reader installed. Reader should be already be installed on most campus computers. If you need Adobe Reader for your own computer, you can download it free from Adobe's web site at <http://www.adobe.com/>. Just go to the web site and click "get Adobe Reader."

The PDF files will require a password to open. This will be the same as the password for the course website. We will announce it in class.

Jon is counting on your feedback, so please let him know how you feel about the chapters.

Students with Disabilities

If you have a disability, please speak with us about how we can accommodate you during the class.

Assignments, Papers, and Grading

Grades for the course will be based on papers, assignments, and participation in class discussions. There will be no exams.

Papers (50% of course grade)

Papers will be due at the beginning of class on the following days: 14 January; 28 January; 11 February; 25 February; 11 March. Papers must be double spaced, on single-sided 8 1/2 by 11 inch white pages, with at least 1 inch margins, in a font no smaller than 10 point. We 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. Unless you have made a prior arrangement, late papers will penalized 1/2 grade point for every day they are late. We will give more detailed instructions for the papers in class.

Assignments and participation in discussions (50% of course grade)

For most class meetings we will give you an assignment to prepare ahead of time, and/or an assignment to work on together in class. We encourage you to talk about these assignments with your classmates. 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.

This 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 and your classmates the chance to learn from you.

Tentative schedule

Please note that the following schedule of topics is flexible, based on your background and interests. We want to learn from you what issues in evolution and genetics are most compelling and important from your perspective. Read *The Tangled Bank* and *Life 101*, browse the library, the newspaper, and the web, and let us know what you want to cover.

Week 1: Why Study Evolution; Evidence for Evolution

Why study genetics and evolution?

Where do organisms come from, and why are they so well designed?

Week 2: Natural Selection

What is the mechanism of evolution?

Why do we age and die?

Week 3: Human Genetics I

What makes every individual unique?

Why do offspring resemble their parents?

Week 4: Human Genetics II

What does it mean to sequence a genome?

How do genes influence our physiology, behavior, and appearance?

Week 5: Evolutionary Genetics

Can we predict the evolutionary future?

Should we try to control it?

Week 6: Quantitative Genetics

Are members of some ethnic groups genetically superior in intelligence?

Week 7: Reconstructing the past I

How does one species split into two?

How can we reconstruct evolutionary history?

Week 8: Reconstructing the past II

What's a dog?

Did Richard Schmidt try to kill Janice Trahan?

Where did HIV come from?

Week 9: Sexual selection, Altruism

Why are males and females different?

Do nice guys ever finish first?

Week 10: Human Evolution

Are humans really descended from apes?

How are modern humans related?