

BIOL 4830 POPULATION GENETICS
Spring 2010

Instructor: Dr. Marina M. Gerson

Office: N-272

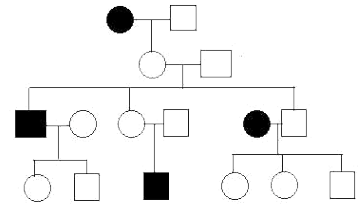
Office Hours: Wednesday 2:30-4:30, Thursday 11-12

Contact Information: mgerson@csustan.edu or (209) 664-6547

Website: <http://science.csustan.edu/gerson/>

Text: Hamilton, M. B. 2009. *Population Genetics*. Wiley-Blackwell. ISBN: 978-1-4051-3277-0

MMG Furlough Days: Feb 25, March 15 & 25, April 21, May 6 & 14. I will not be available on campus nor by e-mail on these days.



COURSE DESCRIPTION AND OBJECTIVES

Students will study genetic variation at the population level. We will examine evidence from natural history, experimentation, and theory. The topics to be discussed include: historical aspects, natural selection, sexual selection, genetic drift, inbreeding, mutation, and geographic structure of populations. Modern applications including comparative genomics, studies of human population genetics, and the use of population genetics in conservation and ecological studies will also be discussed. Throughout the course, a focus on modern techniques will unite theory with current research in the field.

Course Pre-requisite: Passing grade in Introductory Genetics BIOL 3350 or equivalent.

Learning Objectives

- Understand the molecular basis for population-level diversity
- Understand the processes that result in changes in allele frequencies
- Knowledge of the molecular patterns of change that underlie population-level evolution
- Knowledge of factors leading to the evolution of and influencing the expression of complex traits

Course Requirements

- Through in-class activities, apply knowledge of: the genetic basis of population diversity and change, evolutionary processes, techniques in molecular population genetics, and factors involved in complex trait evolution and expression.
- Demonstrate understanding of the contribution of current scientific articles through classroom participation and activities.
- Through homework problems, demonstrate independent basic understanding of: mathematics of population genetics, polymorphism and divergence of nucleotide sequences, and molecular phylogenetic techniques.
- Demonstration of retention of principles of population genetics, covering the four Student Learning Objectives, on quizzes and assignments.

Always remember:

Mutation is random, but evolution is generally directed by selective pressures.

EXPECTATIONS OF STUDENTS

- **Engage the course material** through participation in class, reading the text, and thinking about genetics outside of class.
- **Be respectful of others** by arriving on time, giving your attention to whoever is presenting, listening to the ideas of your classmates, turning off cell phones, and generally being polite. This also means no text-messaging (yes, the person at the front of the room *can* tell what you are doing) and no internet surfing (it's distracting to those sitting around you).
- Students are expected to **take exams** on days and times scheduled. If you have a legitimate excuse to miss, I need to know the reason, in writing, before the exam date. If you have an emergency, you must let me know of the emergency as soon as you can. I will determine the appropriateness of taking the missed exam.
- **Maintain your academic integrity.** *Your integrity is your most valuable asset as a student* and in your future career as an educated person. In line with this, it is the policy of the Department of Biological Sciences that anyone caught *cheating* or *plagiarizing* will receive a grade of F for the course. I reserve the right to request any student suspected of cheating to take a second, different exam on the material. Protect yourself by making your integrity obvious.

EXPECTATIONS OF THE INSTRUCTOR

- Same as those for students, in terms of engagement in the course, respect for participants. I do my best to protect your privacy and maintain an environment in which you can learn.
- Be **open to feedback** on the course and be flexible in order to make appropriate changes to meet student needs.
- Be **fair and consistent in assessment** of student learning.
- Be **available to students** outside of class time to answer questions and discuss class material.

Tentative Course Outline

Week	Lecture Topic(s)	Chapters
Feb 17	Syllabus, Introduction, Mendelian Genetics, Hardy-Weinberg	Ch 1, Ch 2.1-2.4
Feb 24	Fixation, heterozygosity, inbreeding, gametic disequilibrium	Ch 2.5-2.7
Mar 3	Genetic drift and effective population size	Ch 3; Q1
Mar 10	Population structure and gene flow	Ch 4; Paper 1
Mar 17	Mutation	Ch 5; Q2
Mar 24	Natural selection - fundamentals	Ch 6; Paper 2
Mar 31	Cesar Chavez Holiday	--
Apr 7	Spring Break	--
Apr 14	Natural selection – further models	Ch 7; Paper 3
Apr 21	MMG Furlough Day – Q3 due to my mailbox before 4/22	Furlough; Q3
Apr 28	Molecular evolution	Ch 8; Paper 4
May 5	Quantitative traits	Ch 9; Q4
May 12	Mendelian quantitative traits	Ch 10; Paper 5
May 19	Catch-up	1-10; Q5
May 26	Poster Presentations: 4 pm-6 pm	--

ASSESSMENT METHODS, GRADES AND GRADING

In an upper division course for the Biology major, it is important for students to demonstrate both mastery of factual content and the ability to synthesize ideas based on the theories discussed in the class. Your grade will be based on completion of quizzes, problem sets, article readings and discussions, and a poster project presentation.

We will have a quiz at the beginning of every class period (unless a formal exam is scheduled). If you miss class, you miss the points.

Any homework or extra credit assignment should be turned in on the day and time it is due. However, you may turn in **one late assignment in the very next class period** over the course of the semester. The poster session is mandatory and cannot be made up. Following the return of any graded assignment or exam, you have 14 days in which to dispute any grade discrepancies. To dispute the scoring of an assignment, bring the assignment and supporting information showing why you deserved a different grade to my office, where we can discuss the issue privately.

GRADING SUMMARY

ASSIGNMENT	POINTS
5 Homework Sets (30 pts each)	150
5 Article Discussions (10 pts each)	50
5 Article Summaries (50 pts each)	250
10 Objective Quizzes (40 pts each)	400
1 Poster Presentation	150
TOTAL POSSIBLE POINTS	1,000

<u>Point Range</u>	<u>Grade Earned</u>
930-1000	A
900-929	A-
870-899	B+
830-869	B
800-829	B-
770-799	C+
730-769	C
700-729	C-
670-699	D+
630-669	D
600-629	D-
<600	F

ASSIGNMENT INFORMATION

Furlough Assignment

Go to the Virginia Commonwealth University and watch the following five video clips. Each clip is less than ten minutes.

http://www.pubinfo.vcu.edu/secretsofthesequence/playlist_frame.asp

Click the correct title and then Download Video to start watching.

- *All in the Family: Genetics and Family Health History
- A Gene Called ACE – Blood Pressure
- Are the Voices in the Genes – Schizophrenia
- Perfect Pitch – The Musical Gene
- Risk-taking Genes – Genes, Environment, or Both?

Question Sets

Homework sets are from Hamilton (2009). Complete Interactive Boxes and write a 3-5 sentence summary of what you learned from each. Also complete Problem Boxes: Work out answers, documenting your work by hand on paper (even if you use a calculator/software to solve problems). Staple all sheets *before* class, and turn in assignments at the beginning of class (when you walk in).

Q1	Complete Interactive Boxes: 1.1, 2.1, 2.2, 2.3, 2.6 Turn in Problem Boxes: 2.1, 2.2, 2.3
Q2	Complete Interactive boxes: 3.1, 3.2, 3.3, 3.4, 4.1, 4.2 Turn in Problem Boxes: 3.1, 3.2, 3.3, 3.4, 4.1, 4.2
Q3	Complete Interactive boxes: 5.1, 5.2, 5.3, 6.1, Turn in Problem Boxes: 5.1, 5.2, 6.1, 6.2
Q4	Complete Interactive boxes: 7.1, 7.2, 7.3, 7.5, 8.1, 8.2 Turn in Problem Boxes: 7.1, 8.1, 8.2
Q5	Complete Interactive boxes: 9.1, 9.2, 9.3, 9.4, 10.2, Turn in Problem Boxes: 9.1, 9.2, 10.1, 10.2

5 Primary Literature Readings and Discussion Board

For each article:

- a) Access the full-text PDF article through the Blackboard course site.
- b) Read and **summarize each section of the article in your own words**. Type up your summary for submission.
- c) Come up with a one-sentence summary of the entire paper. Post this summary on the Blackboard discussion before class.
- d) After class, go back to Blackboard, and vote on the **best** of your classmate's summaries.

Poster Presentation

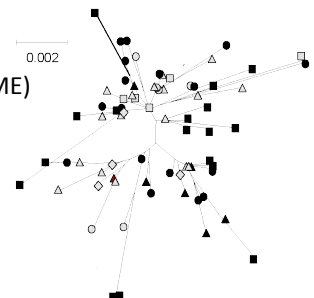
Posters have become an increasingly popular choice for presenting scientific work, especially with the advent of computerized preparation software and large format printers. Poster presentations allow for a more *personalized interaction* between the presenter and the individual audience members, as conference attendees walk through the poster session browsing the selections. Posters have the added advantage of being *less intimidating to present*, since the audience has something to read and the presenter can mainly clarify points and field questions.

Each student in the class will select a **different** recent primary literature article (hint: must have a methodology section) **relating directly to population genetics**. The paper must be **no older than 2004**. Each student will pretend to be a co-author on the paper, get intimately familiar with the work, and present it as a poster at the Poster Session. To find an article, search the Biological Abstracts through the library's webpage.

Sign-ups begin May 1. To sign up:

- 1) Check the Blackboard announcements to make sure the paper is still available.
- 2) E-mail to me with the following information: Authors. Year. Title. Journal Name. (YOUR NAME)

I will review each submission, and I will notify you if your paper is not acceptable. If you need help finding a paper, come in and ask for help!



Your poster for class can be:

- A) Printed out on regular paper, trimmed, and mounted on a piece of regular poster board (or you can make a tri-fold board out of cardboard if you have some large pieces around).
- B) Printed on a large format printer at Reprographics (on campus) or Kinkos/Office Max/etc. If you do use Microsoft PowerPoint to prepare a poster presentation, be sure to create your poster as a single slide. You must format the slide as a custom size and indicate how large a print you want your final poster to be. Talk to your print shop ahead of time to find out at what size they print posters, cost, and how long it takes.

- **The main goal of a poster is to relate the main points of your paper with as little effort as possible on the part of the audience to read, interpret, and understand.**
- Use a suitable font size (can be read from about four feet away).
- Sections should have appropriate labels.
- **Include a Title, Authors and Addresses, Abstract, Introduction, Methods, Results & Discussion. Graphics are required.**
- Only include Literature Cited if you use a major source in the body of the poster (even though the original paper has lots of references).
- Only present the main points.
- Present as clearly as possible with as little text as you can get away with (used bulleted lists instead of paragraphs when you can).
- Use graphics to explain sections when possible.
- **Do NOT duplicate** the same information in your figures/tables and a verbal results/discussion. Use an explanatory caption to explain how the data shown in the figure supports the conclusion in the caption.

Useful Websites on Poster Presentation

Flinn, C. 2000. Developing a Poster Presentation in the Social Sciences.

<<http://writingcenter.gmu.edu/resources/workshops/socscienceposter/sld001.htm>>. Accessed 2/22/2009.

Hammarling, S and N. Higham. 2009. How to Prepare a Poster.

<<http://www.siam.org/meetings/guidelines/poster.php>> Accessed 3/16/09.

Hess, G., K. Tosney, and L. Liegel. 2007. Creating effective poster

presentations.<<http://www.ncsu.edu/project/posters/NewSite/index.html>>. Accessed 2/22/2009.

Kiefer, K., M. Palmquist, L. Barnes, M. Levine, D. Zimmerman, and J. Robinson. 2009. Poster Writing Guide from the Writing Center at Colorado State University.

<<http://writing.colostate.edu/guides/speaking/poster/>>. Accessed 2/22/2009.

Purrington, C. 2007. Advice on designing scientific posters. <<http://www.swarthmore.edu/NatSci/cpurrin1/posteradvice.htm>>. Accessed 2/22/2009.

Stoss, F. 2008. Designing Effective Poster Presentations by The University of Buffalo's Art and Sciences Libraries.

<<http://ublib.buffalo.edu/libraries/asl/guides/bio/posters.html>>. Accessed 2/22/2009.

Where to Get Your Poster Printed? Information current on 2/22/2009

CSU Stanislaus Reprographics MSR B-10D, 667-3013.

Services: Black and white or full color, several papers to choose from.

Time to print: Can be up to two weeks, but faster if you say you have a deadline.

Cost: \$25 for a 48" x 36" full color; not much less for black and white

FedEx Kinkos www.kinkos.com

- Turlock – 1451 Geer Rd, Turlock, CA - (800) 463-3339

- Modesto – 2225 Plaza Pkwy # C11, Modesto, CA - (800) 463-3339

Services: Black and white or full color, several paper types, online print orders

Time to print: Approximately 15 minutes. Send your file by e-mail and it will be ready for pick up when you arrive.

Cost: As low as \$5 for a black and white 30" x 36" on light-weight paper, up to \$80 for full color printing.

Staples 1850 Countryside Dr, Turlock, CA - (209) 632-2209

Services: Black and white or full color, several paper types, online print orders and mail delivery NOTE: Color posters LIMITED - up to 24" high x any length.

Time to print: 2-3 hours for color, black-and-white just a few minutes

Cost: Color 24" x 36" - \$38.39; B&W 24" x 36" - \$2.99; B&W 30" x 36" - \$4.00