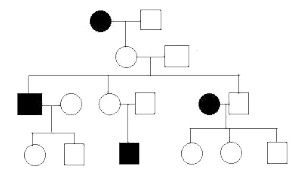


**BIOL 4830 POPULATION GENETICS**  
**Spring 2014**

Dr. M. M. Gerson



**Instructor: Dr. Marina M. Gerson**

**Office: N-272 Office Hours:** Mon & Fri 2-3:30 and by appt.

**Contact Information:** in my office (*best*), [mgerson@csustan.edu](mailto:mgerson@csustan.edu) (*good*) or (209) 664-6547 (*worst*)

**Blackboard site?** Yes! Login at [blackboard.csustan.edu](http://blackboard.csustan.edu) for course documents and links to resources.

**Required Materials:** Hamilton, M. B. 2009. *Population Genetics*. Wiley-Blackwell. ISBN: 1405132779

**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 quiz and exam 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, exams and assignments.

Always remember:

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

**EXPECTATIONS OF STUDENTS**

- **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.**
- **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 quizzes and 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.

**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**

<b>Week</b>	<b>Lecture Topic(s)</b>	<b>Chapters</b>	<b>Hmwk</b>
Jan 29*	Syllabus, Introduction, Mendelian Genetics, Hardy-Weinberg	Ch 1, Ch 2.1-2.2	--
Feb 5*	Hardy-Weinberg, fixation, heterozygosity, inbreeding	Ch 2.3-2.6	Article 1 exercise
Feb 12	Gametic disequilibrium, Genetic drift and effective population size	Ch 2.7, Ch 3	Article 2
Feb 19	Genetic drift cont., Population structure and gene flow	Ch3, Ch 4	Article 3
Feb 26	Gene flow cont., Mutation	Ch 4, Ch 5	Article 4
Mar 5*	<b>Midterm 1</b> Natural selection - fundamentals	<b>Ch 1-5</b> Ch 6	--
Mar 12	Natural selection cont.	Ch 6	Article 5
Mar 19	Natural selection – further models	Ch 7	Article 6
Mar 26	Molecular evolution	Ch 8	Article 7
Apr 2	Molecular evolution cont.	Ch 8	Article 8
Apr 9*	<b>Midterm 2</b> Quantitative traits	<b>Ch 6-8</b> Ch 9	--
Apr 16	Quantitative traits cont.	Ch 9	Article 9
<b>Apr 23</b>	<b>SPRING BREAK – NO CLASSES</b>	--	--
Apr 30	Mendelian quantitative traits	Ch 10	Article 10
May 7*	Poster Session	--	Poster
May 14*	Catch-up & Review for Final	<b>1-10</b>	--
<b>May 21</b>	<b>Final Exam from 2:00-4:00 pm (note time scheduling)</b>	<b>1-10</b>	

\*These weeks there will be no Quiz. All other weeks will have a five minute Quiz at the beginning of class.

**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 assignments, quizzes, exams, a poster project, and participation.

Any homework or extra credit assignment should be turned in on the day and time it is due. The poster session is mandatory and cannot be made up. Following the return of any graded assignment or exam, you have 7 days in which to check your grade entry on BlackBoard and also 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**

<b>ASSIGNMENT</b>	<b>POINTS</b>
Article 1 Exercise	30
8 5-minute Quizzes (35 points each)	280
2 Midterms (150 each)	300
Properly formatted article submission	10
Poster Presentation	150
Poster Evaluation	30
Final Exam	200
<b>TOTAL POSSIBLE POINTS</b>	<b>1,000</b>

<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****All assignment documents and links are available on Blackboard.****Primary Literature Readings**

**Article 1 Exercise** – complete the exercise with reference to Article 1 to learn more about scientific articles, how they are structured, and how to read them.

**Primary Literature Readings**

You will have an article to read before class almost every week. Plan sufficient time to do this reading. For each article, make sure you identify the problem/hypothesis, general methods for testing the hypothesis, types of data generated, conclusions and implications of the work, and the specific concepts in population genetics to which the article relates. I strongly recommend delving into the text book to read some introductory information about each of the population genetics concepts addressed in the article.

**Suggested Problem Sets**

Problem sets are from Hamilton (2009) and many other sources. These problem sets will not be turned in and will not be graded. However, they will allow you to practice the problem types presented in class in preparation for quizzes and exams.

**Quizzes**

- A 5-minute Quiz will take place at the *beginning* of most class periods. If you miss class or arrive late, you miss the points.
- There are 9 scheduled quizzes, but only your 8 highest scores will count. Because of this, there will be no make-up quizzes for days missed for any reason - we just drop that 0 score.
- Quizzes will be open book, open article, and open note. However, *you will not have time to complete your quiz in five minutes if you have not already well-prepared for the quiz.*
- Quizzes will test your reading of assigned articles, theories presented in class, and understanding of problems worked in class the previous week.
- To prepare for Quizzes: read the assigned article, use your text book to review theories and concepts presented in the previous class period, and practice problems similar to the ones worked in class.

**Exams**

- Two midterms and a final exam will test your comprehension and retention of population genetics concepts and theories, ability to solve population genetics problems, and understanding of current research in the field.
- Midterm exams will be scheduled for the first hour of the class period. Be on time to take advantage of the full exam period.
- Exam questions may include short answer, definition, T/F, graphing, and mathematical problem solving.
- Formulas will be provided as needed, but you should know which formula to apply and how to use it.
- Be sure to bring your calculator, pencil, and eraser.

**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 2009**. 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. In the poster session, the class will be divided into two groups. Each group will spend time as presenters and as audience. When you are a presenter, you will stand next to your poster and help your classmates to understand the work you are presenting. When you are the audience, you will mill about the room learning about the topics that interest you (and evaluating a required set of posters).

To find a suitable paper:

- Go to the library website.
- Click "Journals" tab.
- Click "Databases by subject."
- Click "Biology."
- Choose "Biological Abstracts."
- Choose your search terms carefully to find a paper related to **population genetics** and a subject of interest to you.
- Take care in selecting your paper. You will be spending a significant amount of time with it.
- Look closely – is the paper primary literature? Is there a Methods section?
- **Any particular paper can only be used by one student.**

**Article Sign-ups begin April 9.****To sign up:**

- 1) Check the Blackboard announcements to make sure the paper is still available.
- 2) To earn 10 points for article submission, e-mail to me with the following information typed by you in ***exactly in this format***:  
Authors. Year. Title of the article. 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! There are literally thousands of papers to choose from!

**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, 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 instead of words 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-template.php?id=45>>. Accessed 1/20/2012.

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

<<http://www.siam.org/meetings/guidelines/poster.php>> Accessed 1/20/2012.

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

<<http://www.ncsu.edu/project/posters/NewSite/Resources.html>>. Accessed 1/20/2012.

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 1/20/2012.

Purrington, C. 2007. Advice on designing scientific posters. <<http://www.swarthmore.edu/NatSci/cpurrin1/posteradvice.htm>>. Accessed 1/20/2012.

**Where to Get Your Poster Printed?** *Pricing information may be outdated.* It could cost more, but it more likely costs less!

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

**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](http://www.kinkos.com)

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

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

**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 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