

**BIOL 4830 POPULATION GENETICS**  
**Spring 2012**

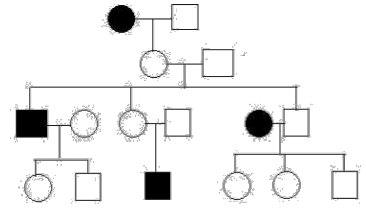
**Instructor: Dr. Marina M. Gerson**

**Office: N-272**

**Office Hours: Wed 1-4 pm**

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

**Text: Hedrick, P.W. 2011. *Genetics of Populations*, 4<sup>th</sup> edition. Jones & Bartlett.**



**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	Hmwk Due
Feb 1	Syllabus, Introduction, Review of Genetics and Genetic Variation	1	--
Feb 8	Genetic Variation cont.; Hardy-Weinberg Principle	1, 2	Art 1 Exercise
Feb 15	Hardy-Weinberg, fixation, heterozygosity	2	Art 1
Feb 22	Gametic disequilibrium, Genetic drift, Effective population size	4	P1, Q1
Feb 29	Genetic drift cont., Population structure, Gene flow	4, 7	--
Mar 7	Gene flow cont., Mutation	7, 5	Art 2
Mar 14	Mutation; Natural Selection	5, 3	P2, Q2
Mar 21	Natural Selection cont.	3	--
Mar 28	Molecular evolution & Neutral theory	6	Art 3
Apr 4	Neutral theory & Coalescence	6	--
<b>Apr 11</b>	<b>SPRING BREAK – NO CLASSES</b>		
Apr 18	Inbreeding	8	P3, Q3
Apr 25	Quantitative traits	9	--
May 2	Poster Session	--	Poster
May 9	Catch-up	1-9	P4, Q4
<b>Wed. May 23</b>	<b>Final Exam during regular class time</b>	<b>1-9</b>	<b>--</b>

Art=Article, P=Problem set, Q=Quiz

**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 summaries, a poster project presentation, and a final exam.

Any assignment of any kind 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. Any other late work will be penalized by 10% per 24 hour period. 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, please 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
Article 1 Exercise	60
3 Article Summaries (50 pts each)	150
4 Problem Sets (40 pts each)	160
4 Objective Quizzes (70 pts each)	280
Poster Presentation & Evaluations	150
Final Exam	200
<b>TOTAL POSSIBLE POINTS</b>	<b>1,000</b>

Point Range	Grade Earned
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

**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.

### **Primary Literature Readings**

For each article:

- a) Access the full-text PDF article through the Blackboard course site, or find it through the library website.
  - b) Read and **summarize each section of the article in your own words**. Type up your summary (double-spaced) for submission through TurnItIn on our BlackBoard course site. Please aim for plagiarism scores less than 25%.
- 1) Long, J.C., J. Li, and M.E. Healy. 2009. Human DNA sequences: more variation and less race. *American Journal of Physical Anthropology* 139(1, SI):23-34.
  - 2) Fendersen, L.E., A.I. Kovach, J.A. Litvaitis, and M.K. Litvaitis. 2011. Population genetic structure and history of fragmented remnant populations of the New England cottontail (*Sylvilagus transitionalis*). *Conservation Genetics* 12(4): 943-958.
  - 3) Mejía, N., M. Gebauer, L. Muñoz, N. Hewstone, C. Muñoz, and P. Hinrichsen. 2007. Identification of QTLs for seedlessness, berry size, and ripening date in a seedless x seedless table grape progeny. *American Journal of Enology and Viticulture* 58(4):499-507.

### **Problem Sets**

Homework sets are from Hendrick (2011). 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). Note that answers to problems are in the back of each chapter, hence the low point value of these assignments.

<b>P1</b>	Ch 1: 1, 3, 5, 6, 8, 10, 13, 16, 18 Ch 2: 1, 2, 5, 8, 10, 13, 16
<b>P2</b>	Ch 4: 1, 3, 4, 5, 7, 10 Ch 7: 1, 2, 3, 6, 7 Ch 5: 1, 2, 3, 5, 7, 10
<b>P3</b>	Ch 3: 3, 5, 8, 13, 17, 21, 25 Ch 6: 1, 3, 5, 8, 9, 12
<b>P4</b>	Ch 8: 1, 3, 8, 12, 14, 15 Ch 9: 2, 4, 13, 15

### **Quizzes**

- Scheduled quizzes will take place at the *beginning* of the class period. If you miss due to an unexcused absence, you miss the points.
- Quizzes will cover material from class, readings, and problem sets.

### **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 2005**. 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.
- **Any particular paper can only be used by one student.**

**Sign-ups begin April 4<sup>th</sup>**

- 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-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 could cost 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