

BSCI 222 - Principles of Genetics – Fall 2013

Lectures: TuTh 11:00am -12:15pm in HJP 0226

Professor: Tom Kocher (tdk@umd.edu)
Department of Biology, 2132 Biosciences Research Building
Office hours by appointment

Teaching Assistants: Betsy Clark fclark@umd.edu
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Recitation: You must be in one of the following recitation sections. Recitations begin Monday, Sept 9.

2211 (10105)	M	12:00pm- 1:50pm (PLS 1162)	Carol
2215 (10106)	Tu	2:00pm- 3:50pm (HJP 3233)	Will
2221 (10107)	Tu	4:00pm- 5:50pm (PLS 1184)	Betsy
2231 (10108)	Tu	6:00pm- 7:50pm (PLS 1184)	Betsy
2251 (10109)	W	12:00pm- 1:50pm (PLS 1158)	Carol
2261 (10110)	W	7:00pm- 8:50pm (PLS 1184)	Will
2265 (10111)	Th	2:00pm- 3:50pm (PHY 1402)	Will
2267 (10112)	Th	4:00pm- 5:50pm (PLS 1172)	Betsy
2271 (10113)	Th	6:00pm- 7:50pm (PLS 1180)	Carol

Text: Pierce BA. *Genetics: A Conceptual Approach (4th ed.)* W. H. Freeman Publishers.

Suggested prerequisites: Introductory Biology, Introductory Chemistry

Evaluation: We will give three ‘hour exams’ and a cumulative final exam. Your exam average will be calculated on your best 3 exams and represents 75% of your grade. If you take all three ‘hour exams’ we will calculate a ‘guaranteed’ grade for the semester, and you can choose whether or not to take the final. Makeup exams will not be given; if you miss an exam we will calculate your grade based on the other three exams.

The remaining 25% of your grade will come from the points earned in your recitation section:

Weekly quizzes	30%	(8-10 quizzes, 10 points each)
Participation	30%	(Participate in class discussions, homework problems)
Writing exercises	40%	(Book report, movie review, creative writing)

Lecture Schedule

Dates	Topics	Read pages
Unit 1: Molecular Genetics		
Sep 3	Introduction: The era of personal genomics (Chapter 1)	1-14
5	DNA structure and replication (Chapters 10, 12)	271-290; 321-350
10	Methods of DNA sequencing (Chapter 19)	534-537
12	Transcription, RNA molecules (Chapters 13, 14)	351-400
17	Translation (Chapter 15)	401-430
19	Control of prokaryotic gene expression (Chapter 16)	431-458
24	Regulatory control in eucaryotes (Chapter 17)	459-480

Unit 2: Transmission Genetics

Sep	26	Mendel's laws (Chapters 2,3)	15-71
Oct	1	Exam – Unit 1 (covers chapters 1, 10, 12-17, 19)	
	3	Complications of sex (Chapter 4)	73-97
	8	Gene interactions: epistasis (Chapter 5)	99-133
	10	Pedigree analysis and mating taboos (Chapter 6a)	135-143
	15	Population genetics of deleterious recessives (Chapter 25)	693-720
	17	Designer babies, pre-natal testing (Chapters 6b, 9, 11a)	146-160; 239-270; 291-301
	22	Development: How does an embryo boot up? (Chapter 22)	611-635

Unit 3: Quantitative Genetics

	24	Genotype to phenotype (Chapter 6b, 24a)	143-146; 659-691
	29	Your genetic identity	
	31	Exam - Units 2 & 3 (covers chapters 2-6, 9, 11a, 22, 24a, 25)	

Unit 4: Genomics

Nov	5	Genetic mapping (Chapter 7)	161-202
	7	Mapping quantitative traits (Chapter 24b)	678-680
	12	Sequencing the human genome (Chapter 20)	557-590

Unit 5: Biotechnology

	14	Biotechnology, industrial genomics (Chapter 8,19)	203-238; 513-555
	19	Genetic engineering, superfoods debate	

Unit 6: Broken genes

	21	Mutation and repair (Chapter 18), transposons (Chapter 11b)	481-511; 303-320
	26	Mitochondrial DNA, aging and disease (Chapter 21)	591-609

***** Thanksgiving Break *****

Dec	3	Genetics of cancer (Chapter 23)	637-658
	5	Exam – Units 4, 5 & 6 (covers chapters 7, 8, 11b, 18-21, 23, 24b)	

Unit 7: Genetic basis of evolutionary change (Chapter 26)

	10	Superbugs: Evolution of antibiotic resistance	721-744
	12	Human origins and the concept of race	

***** Final exam (Chapters 1-26): 8-10 am, Monday December 16 (HJP 0226) *****

BSCI 222 Recitations

The primary purpose of recitations is to give you the opportunity to ask questions arising from lecture, and to go over homework problems.

Weekly quiz: There will be a short quiz (<10 minutes, 3-5 questions) at the beginning of each recitation. The quiz is intended to make sure that you are prepared for the recitation. If you attend lecture, read the book, and make a serious attempt to do the assigned homework, you should be fine. We're not trying to evaluate you with these quizzes - we expect that quiz averages will be 90%. Experience has shown that these quizzes motivate attendance, and help start the discussion. (10 points per quiz, 8-10 quizzes over the semester)

Problem sets: For most chapters, I will assign a set of 5-10 homework problems each week. I select the problems carefully, to focus on what I consider the key concepts for each chapter. For the first few weeks of the course, expect to turn in these assignments to your TA as part of your participation grade. Later in the semester, we may not ask you to turn them in...but you are always welcome to turn them in for comments. Doing homework problems is key to success on the exams!

Writing exercises: I feel very strongly that it is important to incorporate a discussion of ethical issues, and the impact of modern genetics on society, into this class. It may be the most important and lasting contribution this course makes to your education. Before the end of the semester, you need to complete three writing assignments – one from each of the areas listed below:

1. Book Report

More than just a description of the contents, you should include a discussion of a major issue raised by the book. For examples, see the NYTimes book reviews. Choose a book from the list below, or ask permission to put another book on the list.

- a. "Just Genes: The Ethics of Genetic Technologies" Carol Isaacson Barash
- b. "The \$1000 Genome: The Revolution in DNA Sequencing and the New Era of Personalized Medicine" Kevin Davies
- c. "A Life Decoded" Autobiography of J. Craig Venter, leader of a privately-funded project which sequenced the human genome.
- d. "Genome: The Autobiography of a Species in 23 Chapters" Matt Ridley
- e. "Avoid Boring People: Lessons From a Life in Science" James D. Watson
- f. "Rosalind Franklin: The Dark Lady of DNA" Brenda Maddox
- g. "War Against the Weak: Eugenics and America's Campaign to Create a Master Race" Edwin Black
- h. "The Genetic Revolution and Human Rights: The Oxford Amnesty Lectures 1998" Justine Burley (Editor)
 - a. "Mapping Fate: A Memoir of Family Risk, and Genetic Research" Alice Wexler
 - b. "In Pursuit of the Gene: From Darwin to DNA" James Schwartz
 - c. "Who Owns You?" David Koepsell
 - d. "Babies by Design" Ronald M. Green
 - e. "The Immortal Life of Henrietta Lacks" Rebecca Skloot
 - f. "The Case Against Perfection" Michael J. Sandel

2. Movie Review

I encourage you to get together in small groups to watch and discuss a movie relating to the theme of "Genes and Society". Some classics are listed below. Again, be sure your review focuses on the major ethical issues raised by the movie.

- a. "GATTACA" (1997) Ethan Hawke, Uma Thurman, Jude Law, and Gore Vidal
- b. "My Sister's Keeper" (2009) Alec Baldwin, Sofia Vassilieva, and Joan Cusack
- c. "Jurassic Park" (1993) Sam Neill, Laura Dern, Jeff Goldblum

3. Creative Writing

Only a small fraction of the general population ever takes a course in Genetics. You therefore have a special, lifelong responsibility to play a leadership role in discussion of genetics and its societal implications. This includes developing your communication skills to engage a variety of audiences. Here is your chance to get creative and develop an engaging essay exploring the conflicts between people and/or ideas at the center of a genetic controversy. The specific form of the essay is up to you. It could, for example, take the form of a short story, a transcript of a TV program, a company brochure, a script for a movie...

Possible topics:

1. The Presidential election of 2048 – candidate platforms on which genetic conditions are acceptable (will be supported under universal healthcare) and which are unacceptable (and will not receive disability benefits). Campaign speech? ‘Meet the Press’ interview?
2. Exclusive NBC Sports coverage of the 2080 HyperOlympics – a new Olympic competition for genetically engineered individuals. You must select from normal human variation (no gills!)
3. Fred and Frank are identical twins who live in a rural village in England. A rape has occurred, and the police are asking for voluntary DNA samples to help narrow the search for the rapist. Fred is ready to volunteer for the DNA testing, when Frank asks him not to...
4. In 2030, everyone carries a copy of the medical records, including their DNA sequence, on their cellphone. Your hot date just went to the bathroom, and you have the opportunity to sneak a peek at their DNA sequence - their genetic future ‘diary’...
5. Susan is a young professional who just had her personal genome sequenced. She now knows she carries the gene for Huntington’s disease. She is agonizing over the decision about sharing this information with others. Her boyfriend? Her parents? Her co-worker? Who should she tell? Who would not want to know?
6. GeneMatch.com, a genetic compatibility dating service. “I found my perfect match on GeneMatch.com, and all our children are above average!”
7. Front page news story on the scientific breakthrough of the year 2016, and its implications for society.
8. You may propose additional topics through discussions with Dr. Kocher. Please do this before beginning to write, because some topics will lead to less interesting essays.

Length: Up to you. Depends on the genre. A minimum of 3 pages would seem appropriate. More than 10 would seem excessive. No specific expectations here, since there are so many literary forms that could be used.

Grading: Each writing exercise will be worth 25 points. Obviously grading of these exercises will be more subjective than for a quiz. Extra points may be awarded for exceptional creativity. Points may be taken off for mistakes in explaining the underlying genetic mechanisms/technology.

Due dates: Writing assignments can be turned in to your TA at any time, and in any order. **The earlier the better!** At the latest, one writing assignment is due by each date: Oct 15, Nov 12, Dec 12.