

## BIO 662: Genetics & Molecular Biology

### Instructors:

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### Course Learning Outcomes:

Students will be able to

- 1) examine how various genome projects are changing research in biology and medicine.
- 2) analyze and discuss different viewpoints concerning ethical questions that are being raised by research stemming from the human genome project.
- 3) apply genetic and molecular biological concepts to case studies of human diseases.
- 4) use bioinformatics tools to research diseases and genomic information.
- 5) conduct laboratory investigations in genetics and molecular biology, including designing and conducting at least one independent investigation.
- 6) analyze data and formulate conclusions for each lab investigation.
- 7) analyze the genetics and cell biology of cancer.

### Class Sessions:

Monday, Wednesday from 1 pm- 5:30 pm, Bresee Computer Lab (Main Library)

Tuesday, Thursday from 1 pm – 5:30 pm, RS119 laboratory

Class attendance will be kept and the school's policy will be enforced as outlined in the university catalog.

### Required Texts:

- 1) Discovering Genomics, Proteomics, & Bioinformatics, 2<sup>nd</sup> ed., 2007, A. Malcolm Campbell & Laurie J. Heyer, Pearson Benjamin Cummings. ISBN-10: **0805382194** | ISBN-13: **978-0805382198**
- 2) One Renegade Cell, 1998, Robert A. Weinberg, Perseus Books Group.

### Important dates:

Last day to add the course:	June 27, 2012
Last day to drop the course:	July 2, 2012
Refund schedule	100% refund if dropped after 1-2 sessions 75% refund if dropped after 3-4 sessions 50% refund if dropped after 5 sessions 25% refund if dropped after 6-7 sessions 0% refund if dropped after 8-12 sessions

### Academic accommodations:

All students are expected to meet the minimum standards for this course as set by the instructor. Students with learning disabilities who may need accommodations should first discuss options and services available to them in the Academic Support Center (ASC) during the first two weeks of the semester. The ASC, in turn, will contact professors with official notification and suggested classroom accommodations, as required by federal law. Approved documentation must be provided by the student and placed on file in the ASC prior to the beginning of the semester.

### Assessment:

Grades will be based on 3 laboratory reports (45%), a take-home exam (30%), and class assignments:

Two Student Presentations (5% each)

Discovery Question Assignments (15%)

The exam will be passed out on the last day of class. It must be received as a Microsoft Word document to [dapage@pointloma.edu](mailto:dapage@pointloma.edu) by 8:00 a.m. on Monday, July 16. There will be a 10% penalty for each day late.

### ***Student presentation guidelines:***

Each student will work with a partner to prepare two presentations to the class: one on a Campbell/Heyer topic and one on a cancer topic, as detailed below.

### **Campbell/Heyer topics:**

The goal of these presentations is to provide background information on topics for which the Campbell/Heyer textbook assumes prior knowledge. Since we all come from different backgrounds, it is unlikely that all of us have this prior knowledge. These presentations should be no more than 10 minutes, and you should allow 20 minutes for discussion and questions on the information you present. The presentation should focus on the basic attributes of the topic using a resource such as the Campbell or Brooker Biology textbook.

### **Example:**

Suppose the topic was X-linked recessive phenotypes. The presenter could show an X-linked pedigree for a recessive phenotype and discuss the salient features that tell us the phenotype is both X-linked and recessive. Then the presenter could contrast X-linked recessive vs. X-linked dominant pedigrees and point out the differences. The presenter could also hand out several pedigrees illustrating various phenotypes and ask the audience to solve them. Please keep to the 30 minute time frame!

### **List of topics:**

- |         |                                                                                                                                       |
|---------|---------------------------------------------------------------------------------------------------------------------------------------|
| June 27 | How does a muscle contract?                                                                                                           |
| June 27 | What is the functional significance of the extracellular matrix?                                                                      |
| July 3  | How do the parts of the cytoskeleton enable it to carry out its function?                                                             |
| July 3  | What are the basics of how a linear DNA molecule is replicated?                                                                       |
| July 5  | The initial RNA product of a gene is not always processed in the same way. What advantage does alternative splicing confer to a cell? |
| July 9  | What is unique about the human genome? (p. 99-106 of Campbell-Heyer)                                                                  |
| July 9  | HIV: How does this virus cause infection & symptoms? How is it treated?                                                               |

### **Weinberg topics:**

The goal of these presentations is to lead a discussion on the assigned chapters from One Renegade Cell.

### **List of topics:**

- |         |                                    |
|---------|------------------------------------|
| June 27 | Ch 1-2, Introduction               |
| June 27 | Ch3-5, Proto-Oncogenes & Oncogenes |
| July 2  | Ch 6-7, Tumor Suppressors          |
| July 3  | Ch 8-9, Colon Cancer               |
| July 4  | Ch 10,11,14, Cell Cycle Control    |
| July 5  | Ch 12-13, Apoptosis                |
| July 11 | Ch 15-16, Tumor Evolution          |

The presenters should spend 5-10 minutes discussing the important points of the reading. The following 20 minutes would then be a class discussion for which the presenters have specific questions/discussion topics prepared. The presenters should have a set of goals, which are usually points that they want everyone to understand or think about, and may also include leading everyone to understand a particular implication of what is being discussed. Please keep to the 30 minute time frame!

Note that although the presenters are leading the discussion, we (Drs. Page and Prosser) are the “experts on the side.” Therefore expect us to sometimes insert questions of our own, correct any misconceptions that arise, and/or add to the discussion based on our expertise. We also encourage you to e-mail us in advance if there are particular points that need clarification before your session.

**Note that cell phones should be turned off (or muted) at all times during class and lab.**

Date	Topic*	Homework*
WEEK 1		
June 25	An overview of the implications of the genetic revolution for society and for biology	
	Muscular Dystrophy: The genetics, p. 3-5	
	Muscular Dystrophy: DNA sequence analysis, p. 6-9	
June 26	Forensics Lab I: Isolate DNA and set-up PCR reactions (DP)	Forensics Lab Handout
	Drosophila Lab I: Analyze flies and set up crosses (MP)	Drosophila Lab Handout
June 27	Student Presentations: Muscle Structure, Extracellular Matrix	Immunoprecipitation &
	Muscular Dystrophy: Analysis of the key protein, p. 9-12	Immunofluorescence tutorials
	Cancer Discussion: Introduction to Cancer; Proto-oncogenes & Oncogenes	+ DQ 18-19 Ch1-5 (Weinberg)
June 28	Forensics Lab II: Restriction digests and gel electrophoresis (DP)	
	Drosophila Lab II: Analyze data (MP)	
WEEK 2		
July 2	UV Lab I: Run prescribed experiment (MP)	UV Lab Handout
	Extension of UV lab I: Plan your own investigation (DP)	Ch6-7 (Weinberg)
	Cancer Discussion: Mutagens and Tumor Suppressor Genes	
July 3	Student Presentation: Cytoskeleton	p. 34-37 (Campbell/Heyer) +
	Muscular Dystrophy: Analysis of the key protein, p. 13-16	DQ 1-3
	Student Presentation: DNA replication	Ch8-9 (Weinberg)
	Assembling DNA Sequence, p. 34-39	
	Cancer Discussion: Colon Cancer & DNA Repair	
July 4	UV lab II: Analyze data from prescribed experiment (MP)	
	Extension of UV lab II: Run your own experiment (DP)	Ch 10,11,14 (Weinberg)
	Cancer Discussion: Immortality & Cell Suicide	
July 5	Student Presentation: Alternative Splicing	p. 41-44 (Campbell/Heyer) +
	Annotating the Genome, p. 41-49	DQ 12-13 + assigned question
	Cancer Discussion: Internal Cell Signaling	Ch12-13 (Weinberg)

Date	Topic	Homework
WEEK 3		
July 9	Imprinting & DNA Methylation, p. 55-58	p. 55-56 + DQ34-36 p. 99-106 + DQ92 (Campbell/Heyer)
	Student Presentations: Human Genome; HIV	
	DNA Analysis: HIV Case Study	
July 10	Drosophila Lab III: Isolate DNA, set up PCR reactions; analyze F2 generation (DP/MP)	DQ37-39
July 11	The Molecular Genetics of Appetite, p. 219-231	p. 219-220 + DQ1 Ch15-16 (Weinberg)
	Cancer Discussion: Tumor Evolution	
July 12	Drosophila Lab IV: Run gels on PCR reactions (MP/DP)	
	Extension of UV lab III.: Present results of your own experiment	

\* Please note the timing of topics and exact homework assignments is approximate and should be viewed as tentative. We'll want to tweak this depending upon how class proceeds.