

**BIO. 372/572 Medical and Environmental Applications of Cell Biology and Genetics (3 cr)**  
**LECTURER: Drs. Lisa Dorn and Bea Holton**  
**Spring 2012**

OFFICE: **LD:** HS45, **BH:** HS42, PHONE: **LD:** 3064, **BH:** 7087

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OFFICE HOURS:

**LD:** Posted on the announcements page of D2L

**BH:** M: **2pm – 4pm** W: 12:40-3pm; or by appointment.

LECTURE HOURS: 11:30am-12:30pm MWF in Halsey Science HS367.

TEXT: Lodish, et. al. (2007) **Molecular Cell Biology**, 6<sup>th</sup> edition, W.H. Freeman and Company,

**OBJECTIVES:**

**Do you ever wonder if 60 minutes is giving you an accurate description of the latest findings in Alzheimer's research, the genetics of obesity and other health concerns? What is all the hullabaloo over pollutants, climate change or endangered species? How can new molecular and cellular techniques inform these "tree-hugger" topics?**

**In this course, we will discuss the principles and techniques of cell biology and genetics that apply to a variety of medical issues as well as other societal topics. For example, the molecular basis of drug addiction, cancer, aging and long term memory might be discussed but also the application of molecular techniques to species conservation, evolution and environmental influences on humans and other species.** This course is theme-based, meaning that we will cover 8 topics of current interest where you will first learn about general processes such as receptor/ligand interactions, signal transduction, cytoskeleton (and control of its distribution), gene regulation, epigenetics, cell cycle and protein translocation that apply to current topics (see above).

Throughout this course, we will read and discuss original papers from the scientific literature so that students will become familiar with the methods and the logic that scientists use to test their hypotheses but also the popular press so that students can view such reports with a critical eye.

**ASSIGNMENTS:**

1. **Attendance:** You will be working in groups and partially graded as a group so it's not fair to the rest of the group if they exert significant effort on your projects when you are not there. However, you can miss 2 class periods without punishment, except for days when your group is presenting. ***After that, for every class period you miss your FINAL LETTER GRADE will be reduced by 1/2 a grade (e.g. A to A-, A- to a B+ etc.).*** Exceptions are possible of course, for example, if you have contracted a communicable disease. In that case, STAY HOME!
2. **Presentations/Discussions:** The class will be divided into groups of 5 or 6 people. Each group will choose **two topics** (a cell and a molecular topic from a list we compile) to be responsible for presenting to the rest of the class. Holton and Dorn will provide you with two papers, one from the popular press and one from the primary literature. Each group is responsible for:
  - a. Researching the background information you and your peers will need in order to understand the two papers. This will be information you can find in the textbook. **You will be given 5 class periods to prepare (in class).**
  - b. Developing a presentation of the background information and of the papers. **Again, this will be part of your 5 class periods devoted to preparation.**
  - c. Presenting the background information.

- d. Presenting and leading a discussion of both papers.
  - e. We expect each person in the group to contribute equally to these presentations.
3. **Quizzes:** Holton and Dorn will administer **8 very short quizzes**, one per topic given the day of the primary literature presentation. This is to encourage you to keep up with the readings.
  4. **Papers:** You will write 2 one-page papers that describe and interpret a single figure(s) from one of the 8 papers (primary literature, not popular press ones) we will discuss (**you must choose one of the six papers that your group is not presenting**).
  5. **Graduate Student Assignment:** A 5 page single-spaced paper reviewing in more detail one of the topics they presented or a topic of their choice. The paper topic must be approved by Dorn and/or *Holton before Spring Break*.
  - 6.

### **Outline of Topics\***

The textbook readings will depend on the topics currently receiving attention in the popular press but likely will include:

#### **Health/Medical Issues:**

1. **Manipulating Genes: Genetic Engineering**
  - a. GMOs
  - b. Gene Therapy
2. **Evidence for Evolution**
  - a. Human Population Genomics
  - b. Evolution of the Cell
  - c. Local Adaptation
  - d. Butterflies and mimicry
3. **Epigenetics**
  - a. Disease: FMRP and Cancer
  - b. Evolution of miRNA
4. **Memory –**
  - a. Long term potentiation
5. **Aging**
  - a. Lysozomal Activity
  - b. Telomeres
  - c. Starvation diets
  - d. Resvatrol
  - e. mtDNA
6. **Stem Cell Research**
  - a. Current methods
  - b. Adult vs. embryonic
  - c. Applications?
7. **Epigenetics**

**\*This is an advanced class that covers current, interesting topics. If you have topics that YOU would like to see covered, please give them to us and we will try to work them in.**

### **GRADING: Undergraduates**

Participation in preparation stage (peer graded) 15%  
Quality of Background Information (Holton/Dorn grades) 20%  
Quality of Literature Presentation (Holton/Dorn grades) 15%  
Quizzes (8 Holton/Dorn grades) 20%  
Papers (2 Holton/Dorn grades) 30%

### **GRADING: Graduates**

Participation in preparation stage (peer graded) (If poor participation letter grade reduced by ½ )  
Quality of Background Information (Holton/Dorn grades) 20%  
Quality of Literature Presentation (Holton/Dorn grades) 15%  
Quizzes (8 Holton/Dorn grades) 20%  
Papers (2 Holton/Dorn grades) 30%  
Final Paper 15%

### **GRADING SCALE:**

A = 93-100%, A- = 90-92  
B+ = 87-89, B = 83-86, B- = 80-82,  
C+ = 77-79, C = 73-76, C- = 70-72,  
D+ = 67 - 69, D = 63-66, D- = 60-62  
F (Failure) < 60

## **WRITING ASSIGNMENTS: General Instructions**

We will provide students with selected data from the literature that are relevant to theories discussed in class. Students are to treat the data as though they were their own and as though they wanted to present them to others in their field. Consequently, you must first capture the interest of the reader by explaining the significance of the hypothesis tested in your paper; second, explain clearly the results so that the reader understands their meaning and draws the same conclusions as you and, finally, discuss how your results expand upon knowledge published to date. Each paper will have:

- **Introduction** that gives some background information but mostly outlines questions in the field (that will be addressed by your data) and significance of the work presented. A rationale statement is often useful.

- **Results** section that explains the data. What do the data show? (To answer this question, you may also have to explain a bit about the techniques used and the rationale for doing specific experiments.) Why were certain controls done?

- **Discussion** section in which a reasonable hypothesis is formulated from the data.

This sounds like a lot of writing, but, in fact, the maximum page length will be **two** typewritten, single-spaced page (font no less than 12). The key is to think clearly, write concisely and say exactly what you mean...no more, no less.

Students may discuss the data (and interpretations of the data) among themselves. However, they can ask us questions, preferably in class where all can profit from the questions and answers.

Lec #	Day	Date	Topics	Assignment Due
1	M	30-Jan	Introduction to the Course: Organize the groups, assign papers.	
2	W	1-Feb	Discuss with your group an outline of what you think you need to know. Must be approved by instructor before end of the class.	Briefly review your first papers
3	F	3-Feb	Research the background information. Begin preparing a presentation.	
4	M	6-Feb	Preparation continues.	
5	W	8-Feb	Preparation continues.	
6	F	10-Feb	Preparation and Practice Presentation	
7	M	13-Feb	<b>Popular Article</b> Discussion #1	Read Popular Press Article.
8	W	15-Feb	Background Information Presentation #1	
9	F	17-Feb	Presentation of <b>Primary Literature Article #1</b> and Discussion	Quiz on Topic; Read Pimary Lit Article.
10	M	20-Feb	Preparation and Practice Presentation	
11	W	22-Feb	<b>Popular Article</b> Discussion #2	Read Popular Press Article.
12	F	24-Feb	Background Information Presentation #2	
13	M	27-Feb	Presentation of <b>Primary Literature Article #2</b> and Discussion	Quiz on Topic; Read Pimary Lit Article.
14	W	29-Feb	Preparation and Practice Presentation	

15	F	2-Mar	Popular Article Discussion #3	Read Popular Press Article.
16	M	5-Mar	Background Information Presentation #3	
17	W	7-Mar	Presentation of <b>Primary Literature Article #3</b> and Discussion	Quiz on Topic; Read Pimary Lit Article.
18	F	9-Mar	Preparation and Practice Presentation	
19	M	12-Mar	Popular Article Discussion #4	Read Popular Press Article.
20	W	14-Mar	Background Information Presentation #4	
21	F	16-Mar	Presentation of Primary Literature Article #4 and Discussion	Quiz on Topic; Read Pimary Lit Article. <b>Paper #1 Due</b>
	M	19-Mar	<b>SPRING BREAK</b>	
	W	21-Mar	<b>SPRING BREAK</b>	
	F	23-Mar	<b>SPRING BREAK</b>	
22	M	26-Mar	Preparation for each groups 2nd paper.	
23	W	28-Mar	Preparation for each groups 2nd paper.	
24	F	30-Mar	Preparation for each groups 2nd paper.	
25	M	2-Apr	Preparation and Practice Presentation	
26	W	4-Apr	Popular Article Discussion #5	Read Popular Press Article.

27	F	<b>6-Apr</b>	Background Information Presentation #5	
29	M	<b>9-Apr</b>	Presentation of Primary Literature Article #5 and Discussion	Quiz on Topic; Read Pimary Lit Article.
30	W	<b>11-Apr</b>	Preparation and Practice Presentation	
31	F	<b>13-Apr</b>	Popular Article Discussion #6	Read Popular Press Article.
32	M	<b>16-Apr</b>	Background Information Presentation #6	
33	W	<b>18-Apr</b>	Presentation of Primary Literature Article #6 and Discussion	Quiz on Topic; Read Pimary Lit Article.
34	F	<b>20-Apr</b>	Preparation and Practice Presentation	
35	M	<b>23-Apr</b>	Popular Article Discussion #7	Read Popular Press Article.
36	W	<b>25-Apr</b>	Background Information Presentation #7	
37	F	<b>27-Apr</b>	Presentation of Primary Literature Article #7 and Discussion	Quiz on Topic; Read Pimary Lit Article.
38	M	<b>30-Apr</b>	Preparation and Practice Presentation	
39	W	<b>2-May</b>	Popular Article Discussion #8	Read Popular Press Article.
40	F	<b>4-May</b>	Background Information Presentation #8	
41	M	<b>7-May</b>	Presentation of Primary Literature Article #8 and Discussion	Quiz on Topic; Read Pimary Lit Article. <b>Paper #2 Due</b>
42	W	<b>9-May</b>		

43	F	<b>11-May</b>		
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