

BIO. 372/572 Medical and Environmental Applications of Cell Biology and Genetics (3 cr)

LECTURER: Drs. Lisa Dorn and Bea Holton

Spring 2013

OFFICE: **LD:** HS45

BH: HS42

PHONE: **LD:** 3064

BH: 7087

E-MAIL: dorn@uwosh.edu; holton@uwosh.edu.

OFFICE HOURS:

LD: Posted on the announcements page of D2L

BH: Tu 1:30-3pm; Wed. 1:50-3:30pm

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

*Both instructors are S.A.F.E. trained.

TEXT: Lodish, et. al. (2007) **Molecular Cell Biology**, 7th 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.

By the end of this course, students should have

- 1) improved writing and presentation skills
- 2) acquired an advanced understanding of topics in cell biology and genetics
- 3) developed their ability to read original research papers
- 4) grasped the idea of how academic research allows understanding of medical issues, evolution, conservation and other current societal concerns

GRADE ELEMENTS:

1. **Attendance:** You will be working and presenting in groups and so it's not fair to the rest of the group if they exert significant effort on your part of the project 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 about 4 people. Each group will choose **two topics** to present 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. If, during your research of your topic, you come upon a primary literature article that is more current and more interesting to you, you may present that paper instead, BUT, only after gaining permission of Bea and Lisa.
 - a. Holton and Dorn will provide background information relevant to each topic to help you understand the papers you will be presenting. These lectures will be given during the first two weeks of class.
 - b. Each group will divide into two smaller groups:
 - i. GroupA will develop a presentation of the **experimental techniques** used in the primary literature article.
 - ii. GroupB will develop a presentation of the **results and implications** of those results published in the primary literature article.
 - iii. You will have 2 class periods devoted to preparation **but you are expected to work outside of class as well.**
 - iv. We expect each person in the group to contribute equally to these presentations. That means that one person should NOT present the “hard” concepts and the other person the “easy” concepts.
 - v. The groups (A & B) must swap duties the 2nd time your group presents.
3. **Quizzes:** Holton and Dorn will administer **6 challenging quizzes**, one per topic. The quizzes will be given the day after that topic’s presentations are finished.
4. **Papers:** You will write 2, one-page papers that describe and interpret a couple of figures from one of the 12 papers (primary literature, not popular press ones) that we will discuss. Lisa and Bea will choose those figures and post them on D2L. There will be figures from several of the papers. **You will choose one set of figures, and they must not be from the paper that your group presented.**
5. **Peer grading:** Members of a group will have the opportunity to grade one another.
6. **Graduate Student Assignment:** A 5 page single-spaced paper reviewing, in more detail, one of the topics presented in class or a topic of the student’s choice. References must be included. The paper topic must be approved by Dorn and/or Holton *before Spring Break* and cannot be related to the student’s thesis.

OUTLINE OF TOPICS*

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

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. Reserwatrol
 - e. mtDNA
 - f. Exercise and aging
- 6. Stem Cell Research**
 - a. Current methods
 - b. Adult vs. embryonic
 - c. Applications?

***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.**

UNDERGRADUATE REQUIREMENTS

GRADING:

Group participation (peer graded) 10%
 Quality of Methods Presentation (Holton/Dorn grades) 20%
 Quality of Results Presentation (Holton/Dorn grades) 20%
 Quizzes (8 Holton/Dorn grades) 20%
 Papers (2 Holton/Dorn grades) 30%

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

GRADUATE REQUIREMENTS

OBJECTIVES:

In comparison to the undergraduates, the graduate students will be expected to demonstrate:

- A greater depth of knowledge. This will be assessed through presentations, quizzes and papers.
- Greater ability or effort to synthesize information. This will be assessed through presentations and papers.
- More sophisticated communication, both oral and written. This will be assessed through presentations and papers.
- Greater skills proficiency (e.g. mastery of power point, understanding and interpreting data presented to them, etc.). This will be assessed through presentations and papers.
- A leadership role (e.g. modeling intellectual curiosity, directing literature research). This will be assessed through discussion with group members, through their assessment of each other and by watching the dynamics of the group.

ADDITIONAL GRADUATE STUDENT ACTIVITY

A 5 page single-spaced paper is required that will review in more detail one of the topics they presented or a topic of their choice, including references. The paper topic must be approved by Dorn and/or Holton *before Spring Break* and cannot be related to their thesis topic.

GRADING:

Group participation (peer graded); if **poor participation, letter grade will be reduced by ½**; this is a stricter standard than that for undergraduates

Quality of Methods Presentation (Holton/Dorn grades) 16.7%

Quality of Results Presentation (Holton/Dorn grades) 16.7%

Quizzes (8 Holton/Dorn grades) 20%

Papers (2 Holton/Dorn grades) 30%

Final Paper 16.6%

GRADING SCALE:

A = 94-100%, A- = 90-93

B+ = 88-89, B = 84-87, B- = 80-83,

C+ = 77-79, C = 74-76, F <73

NOTE: ANY GRADE BELOW A 'C' IS CONSIDERED FAILING

EXPECTATIONS FOR ORAL PRESENTATIONS:

1. Each person should present equal amounts of material (i.e. time)
2. Each presentation should take **no more than 45 minutes** leaving 15 minutes for questions either during the presentation or after.
3. Clarity, accuracy and precision of oral and slide text will be evaluated
4. Complexity of the topic will be considered. A lower score will be assigned to students consistently avoiding the difficult parts of the topic.
5. Pace of presentation (not too fast, not too slow). Judiciously pare down the information to fit the time slot.
6. Quality of the slides: the # of slides with only words or poor illustrations will reduce your score. Your score will *really* go down if your slide contains phrases that don't make a lot of sense (dwell on *teaching* your audience) or are incorrect!
7. Ability to answer questions (researching in between methods presentation and results presentation is a plus) (OK to say I don't know). You *must* know what you are talking about!! Don't try to fake it.
8. Evidence of understanding beyond the scope of the research paper
9. Following good practices of presenting figures (we will provide advice)

*** Everyone should place their presentation in the dropbox.**

WRITING ASSIGNMENTS:

General Instructions

We will provide students with selected data from the literature that we have 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	Assignments Due Everybody	Assignments Due Presenters
1	M	28-Jan	Introduction to the Course: Organize the groups, assign papers, describe expectations for presentations.		
2	W	30-Jan	Intro to topic 1: lecture material from text <i>Dorn or Holton</i>		
3	F	1-Feb	Intro to topic 2: lecture material from text <i>Dorn or Holton</i>		
4	M	4-Feb	Intro to topic 3: lecture material from text <i>Dorn or Holton</i>		
5	W	6-Feb	Preparation		
6	F	8-Feb	Preparation		
7	M	11-Feb	Topic 1 Article 1 Results Presentation and Discussion	Read Article 1	Submit Power Point
8	W	13-Feb	Article 1 Results: Presentation and Discussion		Submit Power Point
9	F	15-Feb	Article 2 Techniques: Presentation and Discussion	Read Article 2	Submit Power Point
10	M	18-Feb	Article 2 Results: Presentation and Discussion		Submit Power Point

11	W	20-Feb	<i>Quiz and Miscellaneous Day</i>	Quiz on Topic 1	
12	F	22-Feb	Topic 2 Article 3 Techniques: Presentation and Discussion	Read Article 3	Submit Power Point
13	M	25-Feb	Article 3 Results: Presentation and Discussion		Submit Power Point
14	W	27-Feb	Article 4 Techniques: Presentation and Discussion	Read Article 4	Submit Power Point
15	F	1-Mar	Article 4 Results: Presentation and Discussion		Submit Power Point
16	M	4-Mar	<i>Quiz and Miscellaneous Day</i>	Quiz on Topic 2	
17	W	6-Mar	Topic 3 Article 5 Techniques: Presentation and Discussion	Read Article 5	Submit Power Point
18	F	8-Mar	Article 5 Results: Presentation and Discussion		Submit Power Point
19	M	11-Mar	Article 6 Techniques: Presentation and Discussion	Read Article 6	Submit Power Point
20	W	13-Mar	Article 6 Results: Presentation and Discussion		Submit Power Point
21	F	15-Mar	<i>Quiz and Miscellaneous Day</i>	Quiz on Topic 3	
	M	18-Mar	SPRING BREAK		
	W	20-Mar	SPRING BREAK		
	F	22-Mar	SPRING BREAK		
22	M	25-Mar	Intro to topic 4: lecture material from text <i>Dorn or Holton</i>		
23	W	27-Mar	Intro to topic 5: lecture material from text <i>Dorn or Holton</i>		
24	F	29-Mar	Intro to topic 6: lecture material from text <i>Dorn or Holton</i>		
25	M	1-Apr	Preparation		
26	W	3-Apr	Preparation		

27	F	5-Apr	Topic 4 Article 7 Techniques: Presentation and Discussion	Read Article 7	Submit Power Point
29	M	8-Apr	Article 7 Results: Presentation and Discussion		Submit Power Point
30	W	10-Apr	Article 8 Techniques: Presentation and Discussion	Read Article 8	Submit Power Point
31	F	12-Apr	Article 8 Results: Presentation and Discussion		Submit Power Point
32	M	15-Apr	<i>Quiz and Miscellaneous Day</i>	Quiz on Topic 4	
33	W	17-Apr	Topic 5 Article 9 Techniques: Presentation and Discussion	Read Article 9	Submit Power Point
34	F	19-Apr	Article 9 Results: Presentation and Discussion		Submit Power Point
35	M	22-Apr	Article 10 Techniques: Presentation and Discussion	Read Article 10	Submit Power Point
36	W	24-Apr	Article 10 Results: Presentation and Discussion		Submit Power Point
37	F	26-Apr	<i>Quiz and Miscellaneous Day</i>	Quiz on Topic 5	
38	M	29-Apr	Topic 6 Article 11 Techniques: Presentation and Discussion	Read Article 11	Submit Power Point
39	W	1-May	Article 11 Results: Presentation and Discussion		Submit Power Point
40	F	3-May	Article 12 Techniques: Presentation and Discussion	Read Article 12	Submit Power Point
41	M	6-May	Article 12 Results: Presentation and Discussion		Submit Power Point
42	W	8-May	<i>Quiz and Miscellaneous Day</i>	Quiz on Topic 6	
43	F	10-May			