WELCOME TO PROKARYOTIC MOLECULAR GENETICS

BIOL 4608/6608

This course is cross-listed as both BIOL 4608 for undergraduates and BIOL 6608 for graduate students. I have designed this course to introduce you to the field of prokaryotic molecular genetics and to convince you that the study of bacteria is not something of the past, but rather a vibrant and important field today that continues to inform research in many areas. Prokaryotes commonly serve as model systems for understanding cellular functions common to more complex organisms. Much of what we know about the genetic code, transcription, translation, inheritance, and DNA damage was revealed by studies with bacteria. In the first half of the course we will discuss many of these fundamental molecular mechanisms uncovered by historical and current advances made in bacterial research. Bacteria are also interesting in their own right! They perform an incredible array of activities on our planet: as essential participants in Earth's ecology, as cellular factories for useful product production, as beneficial inhabitants of our own bodies, and also as causative agents of many diseases of humans, other animals, and plants. In the later half of the course we will integrate the principles learned in the beginning of the course to discuss examples of elegant regulatory networks used by bacteria to sense and respond to their surroundings and accomplish such diverse tasks.

Finally, my goal is for this course is to illustrate in an engaging and informative manner how scientific progress advances… by people building on what is known and moving science forward step by step. If you are uninterested in the history, mechanisms, and application of bacterial genetics, then this course is not for you.

Instructor, Contact Information, and Office Hours:

Instructor: Dr. Brian Hammer

Office: Cherry Emerson room 223

Email: bhammer@gatech.edu

Phone 404-385-7701

Office hours: by appointment

Class Schedule and Location:

Monday, Wednesday, and Friday

11:05 AM – 11:55 AM

Cherry Emerson Room 320

Required Course Reading Material:

Required text (available at the Georgia Tech bookstore):

Snyder, L. and Champness, W. 2007. *Molecular Genetics of Bacteria*, 3rd edition. ASM Press, Washington, DC.

Supplemental texts (available on reserve in library)

Watson, JD, Baker, TA, Bell, SP, Gann A, Levine M., and Losick, R. 2008. *Molecular Biology of the Gene*, 5th or 6th edition. CSHL Press, Cold Spring Harbor, NY.

Lewin, B. 2008. *Genes V* to *IX*. Jones and Bartlett Publishers, Ontario, Canada.

Required additional supplemental articles (available on T-square in the "supplemental reading folder":

- Review articles
- Primary literature
- Websites

Technology:

T-square Site: We will be using T-square throughout the semester. The web address is: http://www.tsquare.gatech.edu. You will need your prism ID and password to log in (the same login and password you use for Buzzport or your email account).

You are responsible for checking T-square daily for updates to the schedule and reading material as the course proceeds. Supplemental reading assignments currently listed as "TBA" will be amended as semester proceeds.

Grading:

Grading for the course will be broken down as follows:

First take-home exam	25%
Second take-home exam	25%
Cumulative final take-home exam	30%
Presentation (or critique)	10%
Class participation (attendance/reading/discussing)	10%

Grade scale

My goal is to assign letter grades based on the following:

A: 90-100%

B: 80-89%

C: 70-79%

D: 60-69%

F: <60%

Description of Course Assignments

Take-home exams
The first and second in-class exams will each count toward 25% of your final course grade. The final exam will count toward 30% of your grade. All three exams may include several multiple choice, true/false, and short answer, but will primarily be essay questions that will require analysis and interpretation, not regurgitation. All three exams are take-home home exams which you will have about 1 week to complete. The exams are designed so that the answers will not be ones you can simply find in a textbook, but may very well be based on simulated data I provide for a hypothetical experiment. You are expected to work on each exam alone but you may use the textbook, Powerpoints, your lecture notes, and research papers to aid in the completion of your exams. Exam 1 will cover material covered up to the exam, and exam 2 will test students on the material following exam 1. The final exam will be cumulative and cover material from the entire course, with an emphasis on the material covered in the latter third of the course. However, since the topics discussed after exam 2 rely on your knowledge of the earlier material, a comprehensive understanding of the course material will be required for the final exam.

Class Attendance and Participation
Attendance and active participation are **required**. As outlined in the course requirements section of this syllabus, 10% of your course grade will be determined by your active participation in class. I use a "cold-calling" mode of questioning in class. Using index cards you fill out during our first class, I randomly call on students during each class period to promote discussion. I will grade your response based on the scheme below. Therefore, you are expected to read the required material for each class and come ready to participate and contribute. Participation in the discussions and questioning during student presentations is also expected and will be included in your participation grade. Much of the information needed to succeed on the exams will be provided orally in class, but will not be present in the Powerpoint presentations. **If you do not attend class and rely solely on the textbook and the Powerpoint presentations available on T-square following each class, you will most likely do very poorly in this course.**

Index-card class participation grading:
0 - no attempt given to answer question, absent
1 - a poor attempt is given to answer the question, unclear on many points
2 - a good answer with some of the essential features addressed
3 - an excellent answer with most or all of the essential features addressed

Presentation/critiques
Groups composed of graduate students will be assigned and responsible for one of the supplemental research papers indicated in blue on the class schedule. Groups will be developed in the first few weeks of class. Working together, three to five graduate students, will design and present a Powerpoint presentation on the research paper and relevant background information. Their oral presentation will be given during class on

the date assigned. Plan the presentation for 40-45 minutes, allowing 5-10 minutes for questions.

Each undergraduate in class will select one of the Supplemental research papers and independently write up a critical review of that paper. The instructor will indicate a date when undergraduates must decide on which paper they will write a critique. Undergraduates who do not choose a paper by that date will be assigned one by the instructor. A paper copy of the critique is due at the beginning of class on the day of the presentation. An identical digital copy must also be submitted via e-mail or T-square to the instructor by the start of that class. The rubric provided below details the specifics sections of the review and critique.

All students that are not presenting that day will fill out the "presentation assessment form" (see below) at the end of the presentation and turn it in. The presentation grade for each group will be derived from the average of the assessment grade from your peers (50%) and from the instructor (50%). The independent critical review by undergraduate students will be graded by the instructor using the critique rubric (see below). The grade from your presentation or critique represents 10% of your course grade.

Presentation assessment form:

BIOL 4608/6608
Prokaryotic Molecular Genetics
SPEAKER EVALUATION FORM

Presentation Date: _____ Presentation # _____

Presentation Title: _____

Presenters' names: _____

	excellent 5	very good 4	good 3	fair 2	poor 1	tally	total
Mechanics of Communication (10)							
Were the speakers familiar with the A/V equipment?							→
Were the slides easy to read and not overcrowded?							
Presentation (25)							
Was the talk well presented? (typos, slide order, time management?)							→
Did presenters speak loud enough and avoid unnecessary audible "caesura" (uh, errs, um)							
Did speakers strive to keep the audience's attention? (eye contact, voice/expression, inflection?)							
Were speakers attentive to needs of a general audience? (ex: this may sound like "X" but…, can you see in back?)							
Did speakers avoid jargon when simple phrases suffice? (ex: explain technical acronyms, avoid confusing phrases?)							
Content (50)							
Did the talk have a distinct introductory, middle and concluding section?							x 2.5 =
Was the introduction clear and adequate and make audience curious?							
Were the results explained clearly, accurately, and simply?							
Did the conclusion summarize the main point, and make clear what should be taken away from the talk?							
Questions (5)							
Did the talk stimulate interesting questions and were they answered adequately?							→
Group dynamics (10)							
Did each group member contribute sufficiently to the presentation?							x2 =

Strengths: _____

Suggestions for improvement: _____

Overall Evaluation _____

TOTAL

*** this assessment form will be given to presenters after TOTALs are recorded**

Rubric for grading written critiques:

BIOL 4608
WRITTEN REVIEW AND CRITIQUE OF RESEARCH PAPER

You are to write a review and critique of a research paper. The page limit is six pages (title page is not included in page limit) and should adhere to the guidelines below. Each section will be graded as described.

TITLE PAGE	**TOTAL : 4**
Article title, and authors	1
One line summary	2
Your name, date, and course listing	1

SUMMARY/ABSTRACT (no more than 250 words, or ½ a page)	**TOTAL: 16**
Introductory statement	4
Summary of the authors' major material and methods	4
Summary of their major results	4
A brief interpretation of results	4

*I expect that the SUMMARY/ABSTRACT section will be written in your own words and should not duplicate statements from the paper you are critiquing. This section should be able to stand alone.

BACKGROUND (approx. 1 page)	**TOTAL: 10**
A brief summary of the relevant background they provide	5
The purpose of the study	5

EXPERIMENTAL APPROACH AND FINDINGS (approx. 2 pages)	**TOTAL: 30**
The experimental methods	10
The commonly used techniques	10
The major observations	10

CRITICAL REVIEW/ORIGINAL ANALYSIS (approx. 2 pages) **TOTAL: 40**

Is the problem clearly stated? Is this problem an important one in the field?
Does the introduction give sufficient background to help you understand the study?
-(Too narrow? Too broad? Biased? Cited properly?)
Is the methodology well described and appropriate? Were sufficient controls included?
Is a reasonable model given to explain their results?
Were there unexpected results? Is a satisfactory explanation given for them?
Do the authors describe the implications of their study to the field? Do you agree or disagree?
What impressed you in the article? Concerned you?
What is your overall assessment of the article?

*I expect you to address these questions in the CRITICAL REVIEW/ORIGINAL ANALYSIS section.

TOTAL: 100

WAYS TO LOSE POINTS	
Length of review is longer than the maximum allowed	-10
Hand in critique late	-10/day
Misspelling of word, run-on or incomplete sentence, sentence that make no sense	-1 per

Course Expectations and Guidelines:

The Georgia Tech Academic Honor Code applies to all work submitted in this course. To review the Honor Code, please visit http://www.honor.gatech.edu. Unless stated otherwise, all work completed in this course should be an individual effort.

Students with disabilities who require reasonable accommodations to participate fully in the course activities or meet course requirement are encouraged to register with the ADAPTS Disability services at 404.894.2564 or http://adapts.gatech.edu. If you are in need of specific accommodations, please schedule an appointment with me.

You are expected to log into the class T-square site and to check your email daily. You are responsible for all materials posted.

Appropriate classroom behavior is expected at all times. Turn off all cell phones, pagers, and beepers. The only electronic device used can be a laptop if you would like, although this is not required. If you use a laptop, it is for note-taking for this course only, and not for web-surfing, social networking…

Class Schedule:

BIOL 4608/6608: Prokaryotic Molecular Genetics
Fall 2012

#	day	date	topic	reading material due for this class: supplemental material	Snyder/Champness
1	M	8/20/12	Introduction to "Prokaryotic" Genetics	Whitman (2) ; Pace (2) ; Zakaib	Intro section, CH1 p. 55-70
2	W	8/22/12	DNA structure and replication	Watson & Crick; Franklin & Gosling	CH1 p. 1-29
3	F	8/24/12	Chromosomal replication & the nucleoid	Thanbichler	CH1 p. 29-55
4	M	8/27/12	Mutations, mutagenesis I		CH3
5	W	8/29/12	Mutations, mutagenesis II		CH3
6	F	8/31/12	DNA repair		CH11 p. 459-78
-	**M**	**9/3/12**	**LABOR DAY**		
7	W	9/5/12	Transcription		CH2 p. 71-86
8	F	9/7/12	Proteins and translation		CH2 p. 86-106
9	M	9/10/12	Protein folding and export	Shuman	CH2 p. 106-15, CH14 p. 614-22
10	W	9/12/12	Plasmids		CH4
11	F	9/14/12	Conjugation	Chen, et al.	CH5
12	M	9/17/12	Transformation		CH6
-	***W***	***9/19/12***	***presentation/critique 1***	***Meibom, et al.***	***grad student(s)***
13	W	9/21/12	Generalized Transduction, phage trxn & replic		CH7
14	M	9/24/12	Lytic phage, phage genetics		CH7
15	W	9/26/12	Lysogenic phage/Lambda		CH8 up to p. 362
16	F	9/28/12	section 1 wrap up + **EXAM 1**		
17	M	10/1/12	Transposons and transposition		CH9
-	***W***	***10/3/11****	***presentation / critique 2***	***Waldor & Mekalanos***	***grad student(s)***
18	F	10/5/12	Site-specfic recombination		CH9
19	M	10/8/12	Homologous recombination I		CH10
20	W	10/10/12	Homologous recombination II		CH11 p. 478-95
21	F	10/12/12	Transcriptional regulation-negative	Jacob	CH12 p. 499-518
-	**M**	**10/15/12**	**FALL BREAK**		
22	W	10/17/12	Transcriptional regulation-positive		CH12 p. 518-538
23	F	10/19/12	Attenuation/post transcriptional regulation		CH10 p. 447-9
24	M	10/22/12	Protein secretion (type I, II)		CH14, p. 622-5
25	W	10/24/12	Protein secretion (type III)	Schroeder & Hilbi	CH14 p. 625-7
26	F	10/26/12	Protein secretion (type IV)	Cascales & Christie	CH14 p. 627-8
-	***M***	***10/29/12***	***presentation / critique 3***	***Vogel, et al.***	***grad student(s)***
27	W	10/31/12	section 2 wrap-up + **EXAM 2**		
28*	F	11/2/12	sRNA regulation - positive	Majdalani, et al	
29	M	11/5/12	sRNA regulation - negative	Masse et al; Papenfort & Vogel	CH13, p.580-1
30	W	11/7/12	CRISPRs	Karginov & Hannon	
- *	***F***	***11/9/12***	***presentation / critique 4***	***Sapranauskas, et al.***	***grad student(s)***
31	M	11/12/12	SPECIAL TOPIC		
32	W	11/14/12	Signal transduction pathways	Mascher, et al.	CH13 p. 576-8
33	F	11/16/12	Global regulation: envelope stress	Ruiz & Silhavy	CH14 p.582-84
34	M	11/19/12	Global regulation: sporulation		CH14 p. 636-53
35	W	11/21/12	Global regulation: ppGpp	Potrykus & Cashel	
-	**F**	**11/23/12**	**THANKSGIVING**		
36	M	11/26/12	Global regulation: catabolite repression	Busby & Ebright	CH13 p. 548-58
37	W	11/28/12	Global regulation: quorum sensing (QS)	Greenberg; Ng & Bassler	CH13, 587-593
-	***F***	***11/30/12***	***presentation / critique 5***	***Lenz, et al.***	***grad student(s)***
38	M	12/3/12	V. cholerae QS sRNAs	Bardill, Zhao & Hammer	
39	W	12/5/12	V. cholerae QS, chitin, and natural competence	Antonova & Hammer	
40	F	12/7/12	**RECAP/ TAKEHOME FINAL (EXAM 3)**		
	M	**12/10/12**	**FINAL**		
	W	**12/12/12**	**EXAM**		
	F	**12/14/12**	**WEEK**		

** guest instructor*