Biol 4608 Syllabus Fall 2008
Procaryotic Molecular Genetics

This course will examine our current understanding of the molecular mechanisms and macromolecular structures governing bacterial genetic processes. There is no required text for this course however Genes IX by Lewin, Molecular Biology of the Gene sixth edition by Watson et al. and Molecular Genetics of Bacteria by Snyder and Champness are suggested up-to-date references. Topics covered will be discussed in lecture and supplemented with material from texts, reviews, and research articles.

Instructor- Roger M.Wartell IBB Room 1307, email: rwartell@gatech.edu
Classes: MWF at 9 AM
No class for GT on: September 1, October 13, November 28.

Grading based on:	4608	6608
a) two in-class exams: Wednesday September 24	25 pts	25 pts
Friday November 07	25	25
b) class presentation or detailed critique of articles*:	20	25
c) final exam during the week of December 10-14 .	30	25

* - Present in class or write detailed review on 1 article of 4.

Topics:	Reference to Genes IX
I. Physical perspective of the Bacterial Genome	
1. DNA and RNA genomes of bacteria and viruses	1.1-1.3, 1.9
2 DNA & RNA structures; relating to in-vivo function	1.5, 1.6
3. Replication & transcription rates and genome structure	1.7, 1.8, 1.10
4. Basics if DNA mutations; characteristics, terminology, tool	1.11 – 1.15
II. DNA genome in bacterial cell- The nucleoid	
1. Early studies on the nucleoid and its characteristics	28.1, 28.3, 28.4
2. DNA supercoiling and importance to DNA genome	19.12
3. Recent studies characterizing nucleoid	
4. Proteins effecting DNA supercoiling; topoisomerases, binding proteins	19.13-19.15
5. Roles of supercoiling on DNA functions.	
III. Bacterial DNA Replication-	
1. Historical background; linear and circular replicons	15.1, 15.2
2. Link of replication initiation to cell cycle- model	17.1, 17.2
3. Replication origins and initiation	15.1-15.3, 18.15, 18.16
4. Role of DNA methylation on repl. initiation	15.4, 15.5
5. Replication elongation; DNA polymerases & activities,	18.1-18.6, 18.8-18.12
6. Replication termination and genome segregation.	17.3 -17.8
7. Models of replication machinery in cell	

(continued)

IV. Transcription-

1. The basics of gene expression: RNA synthesis and mRNA decay	7.7, 11.1 – 11.3
2. RNA polymerase in bacteria: monomer and subunit approach	11.4 – 11.6
3. Transcription initiation: start sites, mechanism of machine	11.7 – 11.17
4. Mechanism of elongation; steps of the process and protein factors	11.25
5. Mechanisms of termination; By rho or not by rho.	11.20-11.22

V. Regulating Transcription-

1. Effects of DNA sequence within and around promoters -	11.12, 11.13, 11.15
2. Repressors and activators and network control.	12.2, 12.3
3. The lactose operon paradigm; molecular mechanisms	12.4 – 12.21
4. Tryptophan operon; attenuation control, coupling mRNA structural dynamics, movement of RNA polymerase and ribosome.	13.1 – 13.5

VI. RNA Processing & Regulating Gene Expression by RNA regulators

1. tRNA and rRNA processing	9.4
2. Factors governing mRNA half-life	7.7
3. Non-coding regulatory RNAs and Hfq protein: responding to environmental changes.	13.7 – 13.8
4. RNA riboswitches; RNA conformational switches and gene regulation	

VII. Translation of RNA to Protein

1. Overview of translation process	8.1, 8.2, 9.9 -9.11
2. Ribosome structure and molecular revelations	8.16, 8.17
3. Translation mechanism: components, initiation/elongation/termination	8.2 -8.7, 8.10-8.15
4. Using the genetic code: the normal and unusual. Roles of frameshifts of different types.	9.1– 9.3, 9.6-9.8
5. Possible stereochemical origin of the code	- - -
6. Protein Chaperones	10.4 – 10.7