

# BIO 216: Molecular Biology

Dr. Jennifer Larimore

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**OFFICE LOCATION:** BSC 201W

**OFFICE HOUR:**

**LECTURE:** Tues/Thurs 10:00 - 11:15 AM BSC 108 East

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## **1. Required Text and Materials:**

1. *Molecular Biology of the Cell*. WW Norton Press. 6th edition. Bruce Alberts. ISBN number is ISBN: 978-0-393-87094-7.  
**Any format is fine is fine for this class.**
2. *The Problem Book: Molecular Biology of the Cell*. For the 6th edition. John Wilson and Tim Hunt. ISBN-13: 978-0815344537 ISBN-10: 0815344538  
**Any format is fine for this class.**

**2. Class Description:** In this class, we will examine topics that serve as the foundation for many different science disciplines. We will cover transcription, transcriptomics, translation, gene expression, genomics, protein synthesis and proteomics. These varying topics apply to cancer biology, plant biology, evolution, and neurobiology. How an organism makes and uses the molecules required for life is the basis of our understanding of many greater and complex pieces of knowledge.

*Credit and workload: BIO 216 Lecture is a 3-credit course. Here is the workload:*

- 3 hours in-class time + 6 hours out of class work
- read the chapter (about 90 minutes)
- read the article (about 90 minutes)
- work the problems in the problem books (about 90 minutes)
- study the chapter and the problems for the quiz (about 90 minutes)

**3. Class Goals:** This course is required of BMB majors, and is an elective in the Neuroscience and Biology majors. While the lab component has Neuroscience content, the course is designed to enhance the scientific maturation of all STEM majors taking the course. The course objectives are based on skills that are required by scientific employers, medical school and graduate school: critical thinking, scientific skills, team work, motivation, integrity, and scientific communication (both written and oral).

*Skill Goals (taken from NACE competencies) (you can add these to your CV):*

1. Critical thinking/Problem Solving – through weekly article analysis, students will be able to critically read and evaluate scientific literature. Through designing experiments and inquiry-driven laboratory experiences, students will sharpen their ability to think critically about molecular biology.
2. Written Communication – through weekly assignments and the final manuscript in lab, students will demonstrate their ability to write scientifically.
3. Teamwork/Collaboration – working with a lab team as well as a team for presentations will enable the students to practice real-world teamwork competencies that are taught as a part of SUMMIT.
4. Research Skills – as a result of this course, students can design an experiment, analyze the results, draw conclusions, and report on the research both with scientific writing and an oral presentation. The laboratory portion of this course is designed to enhance the learning in the lecture as well as progress the career of each student as a scientist.
5. Career Management – at the end of this course, there is a day to add the relevant skills gained from this course to a student's CV or resume. Additionally, there will be time to work on personal statements and discuss cover letters.

Example CV Entry for this class: (There is a CV template on Canvas. My CV is online: [ilovebrains.org](http://ilovebrains.org))

*Agnes Scott College, Department of Biology Atlanta, Georgia  
January 2022 - May 2022*

Student Researcher, Jennifer Larimore, Ph.D., and Corey Andrews, M.S. mentor

Based on current literature and knowledge, I worked with a diverse team of researchers to design a line of questioning to explore the role of (INSERT YOUR PROTEIN OF INTEREST HERE) in schizophrenia utilizing several complementary lines of molecular research. Based on primary literature which we critically analyzed, we determined that no one has explained the role of (INSERT YOUR PROTEIN OF INTEREST HERE) in the role of schizophrenia. To do this, I utilized fixed microscopy of coronal brain sections. I also prepared biochemical brain fractions to analyze protein levels by immunoblot. The data generated was analyzed using standard statistical analysis. This work resulted in a poster presentation.

93 -100	A
90 – 92.9	A-
87 – 89.9	B+
83 – 86.9	B
80 - 82.9	B-
77 – 79.9	C+
73 – 76.9	C
70 - 72.9	C-
67 – 69.9	D+
63 – 66.9	D
60 - 62.9	D-
Below 60	F

#### 4. **Lecture Grade: Total Lecture 354 points**

Take Home Tests	150 points (3 x 50 points)
Article Questions (Thursdays)	27 points (3 points x 9 discussions)
Questions from the problem book	80 points (8 x 10 points - drop the lowest of 9)
In Class Work (Tuesdays)	50 points (10 x 5 points)
Quizzes (Tuesdays)	27 points (3 points x 9 quizzes)
Reflection Work	20 points

*(the lab is separate) \*additional points or assignments may be added by Dr. Larimore*

## **5. Academic Honesty for your work as a scientist according to our Honor Code:**

- You are responsible. Violations of the honor code result in consequences ranging from failure of the assignment, failure of the course, to expulsion from the college. Speak with your professors if you need clarification
- By placing your name on ANY assignment, you are stating that you completed that assignment with academic honesty.
- do not allow another party to do your work/exam
- do not submit the same or similar work in more than one course without permission
- Cheating includes (a) doing work for another person (b) looking on another person's exam for answers (c) using exams from previous classes without permission (d) using unauthorized notes or resources or (e) helping another student (or receiving help) on work/exam that is supposed to be completed independently.

### **Plagiarism:**

- Plagiarism can include portraying another's work or ideas as your own, buying a paper online and turning it in as if it were your own work, or not citing or *improperly citing* references on a reference page or within the text of a paper.
- If you are using a source and citing the source, the information from that source **STILL** must be reworded in your own voice.
- Do not cut and paste from the slide, your book, your neighbor, Wikipedia, or the internet.

### **Intellectual Fraud:**

- do not falsify or create data and resources or alter a graded work without the prior consent of your professor.
- do not make up a reference for a works cited page or statistics or facts for academic work.

### **Results of Dishonesty:**

- Academic dishonesty is reported to medical schools and graduate schools as per their request.
- Anyone caught cheating relinquishes the privilege of asking for a letter of recommendation
- academic dishonesty will receive a 0 on the assignment.
- Acts of academic dishonesty will be turned over to Honor Court.

## **6. Class Components:**

### **Lectures:**

- Class time will be interactive, therefore reading the assigned chapter/articles prior to class arrival is required and will further your understanding of the material and will prove beneficial to your overall experience within the class.
- There will be 3 point quizzes every Tuesday designed to prepare you for the test and cover the material from the previous week.
- Each Tuesday, you will work with your team to answer questions on the ethical implications of molecular biology research. Each Thursday, article analysis engagement/discussion will be assessed through some group assignments. For both days, the group will load one document per group to canvas with the answers. Group members present will receive a grade.

**Cumulative Tests:** 3 tests spaced throughout the semester to assess your understanding of the information covered in class and your ability to apply and analyze the information.

### **The Problem Book - Assigned Questions:**

These function as review questions for each chapter and assist you in learning. Turn these questions on Canvas in for 10 points per chapter. Your answers **MUST** be in your own words - no quotes, no cut and paste. If you cut and paste from a source or another student, you will receive a 0 on the assignment without any chance to make it up. The lowest problem book grade will be dropped.

## **7. Class Policies:**

*Content Warning:* This course will explore the human brain and behavior, which might raise issues of racism, sexism, classism, heterosexism, cissexism, ableism, and other kinds of privilege. I invite you to come see me if want more information. If you feel you will be unable to fully participate in the course requirements, set up a meeting with the course instructor to determine appropriate accommodations.

*e-mail/tech:* Instructors will make announcements regularly via e-mail so check your Agnes Scott email account daily. When responding to a professor over email, take care that your email is professional. Cell phones should be in the silence mode prior to entering the classroom or lab. Minimize potential distractions if you are using a laptop or tablet in class to take notes.

*Deadlines:* It is your responsibility to keep up with the class material. Students are expected to attend all class periods, except in cases of documented illness or emergency. If a missed class cannot be avoided, it is **STRONGLY** recommended that you contact the instructor **IN ADVANCE**, or within 24 hours of the class period. If you are reading this line of the syllabus before your first day of lecture, as was asked of you, email the professor(s) an image of a llama or alpaca. The time stamp on the email must be before the first day of lecture. And you will get an extra credit point. You cannot alert other classmates to the location of this text. You can only encourage them to fully read the syllabus.

*Course Evaluations:* At the end of the semester you will receive an e-mail asking you to submit an evaluation of the course. Please give feedback! Your input is important to the college as a whole and to us as instructors.

*ADA:* If you have a disability that may have some impact on your work in this class and for which you may require accommodations, please the Office of Academic Advising to register for services.

*Title IX:* For the safety of the entire community, any incidence of or information about sexual misconduct must be reported immediately to Title IX Coordinator Karen Gilbert (kgilbert@agnesscott.edu, 404-471-6435) or Deputy Title IX Coordinator Kristian Contreras (kcontreras@agnesscott.edu, 404-471-6394).

*Inclusion:* This course adheres to the principles of diversity and inclusion integral to the Agnes Scott community. We respect people from all backgrounds and recognize the differences among our students, including racial and ethnic identities, religious practices, and gender expressions. We strive for our campus to be a safe space in which all students feel acknowledged and supported. At the same time, we understand that course content, critical inquiry, and classroom dialogues give us opportunities to examine topics from a variety of perspectives. Such discourse is a defining feature of a liberal arts education, and can compel debates that challenge beliefs and positions, sometimes causing discomfort, especially around issues related to personal identities. While we uphold and preserve the tenets of academic freedom, we request and invite your thoughtful and constructive feedback on ways that we can, as a community of learners, respectfully assist and challenge one another in our individual and collective academic work.

	Date	To Complete BEFORE class	Class Topic
Tues	1/11	Read: Syllabus	Syllabus
Thurs	1/13		Group meetings/how to read a paper
Tues	1/18	<u>BEFORE CLASS:</u> READ: Chapter 1: Cells and Genomes TURN IN ON CANVAS: Problem book Chapter 1; 1 - 21, 41 - 46	<b>1. Cells and Genomes</b> - lecture on chapter 1 - explore the molecular biology - explore potential solutions for problems with molecular biology
Thurs	1/20		
Tues	1/25	<u>BEFORE CLASS:</u> READ: Chapter 3: Proteins TURN IN ON CANVAS: Problem book Chapter 3; 1 - 32, 38-56	<b>2. Race, Ethnicity, and Proteomics</b> - quiz on chapter 1 - lecture on chapter 3 - explore the problems/potential solutions
Thur	1/27	Read: <a href="https://www.sciencedirect.com/science/article/pii/S0969996120304046">https://www.sciencedirect.com/science/article/pii/S0969996120304046</a>	Paper Discussion #1: Stepler et al 2020
Tues	2/1	<u>BEFORE CLASS:</u> READ: Chapter 4: DNA, Chromosomes and Genomes TURN IN ON CANVAS Problem book Chapter 4; 1 - 29, 46 - 56, 60 - 65	<b>3. Personalized Medicine</b> - quiz on chapter 3 - lecture on chapter 4 - explore the problems/potential solutions
Thur	2/3	Read: <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4296905/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4296905/</a>	Paper Discussion #2: Brothers and Rothstein 2015
Tues	2/8	<u>BEFORE CLASS:</u> READ: Chapter 5: DNA replication, repair and recombination TURN IN ON CANVAS: Problem Book Chapter 5; 1- 32, 37 - 45, 56 - 65, 68	<b>4. GMOs/Genomics</b> - quiz on chapter 4 - lecture on chapter 5 - explore the problems/potential solutions
Thur	2/10	Read: <a href="https://pubmed.ncbi.nlm.nih.gov/20850572/">https://pubmed.ncbi.nlm.nih.gov/20850572/</a>	Paper Discussion #3: Weale 2010
Tues	**2/15	TAKE HOME TEST #1 Chapters 1, 3 , and 4	TAKE HOME TEST #1 Chapters 1, 3 , and 4
Thur	2/17**	TAKE HOME TEST #1 Chapters 1, 3 , and 4	TAKE HOME TEST #1 Chapters 1, 3 , and 4
Tues	2/22	<u>BEFORE CLASS:</u> READ: Chapter 6: How Cells Read the Genome TURN IN ON CANVAS: Problem Book Chapter 6; 1- 24, 33-34, 40 - 41, 45 - 58, 78 - 79, 89 - 94	<b>5. Gender Identification in Sports</b> - quiz on chapter 5 - lecture on chapter 6 - explore the problems/potential solutions
Thur	2/24	Read: <a href="https://www.frontiersin.org/articles/10.3389/fsoc.2020.578213/full">https://www.frontiersin.org/articles/10.3389/fsoc.2020.578213/full</a>	Paper Discussion #4: Braumuller et al 2020
Tues	3/1	<u>BEFORE CLASS:</u> READ: Chapter 7: Control of Gene Expression TURN IN ON CANVAS: Problem Book Chapter 7; 1-20, 30 - 40, 50 - 58, 61 - 82, 92 - 102	<b>6. Healing Diseases; which ones?</b> - quiz on chapter 6 - lecture on chapter 7 - explore the problems/potential solutions
Thur	3/3	Read: <a href="https://www.nature.com/articles/d41586-021-01776-4">https://www.nature.com/articles/d41586-021-01776-4</a>	Paper Discussion #5: Ledford 2021
Tues	<b>3/8</b>	<i>PEAK WEEK</i>	<i>PEAK WEEK</i>
Thur	<b>3/10</b>	<i>PEAK WEEK</i>	<i>PEAK WEEK</i>
Tues	3/15	<i>SPRING BREAK</i>	<i>SPRING BREAK</i>
Thur	3/17	<i>SPRING BREAK</i>	<i>SPRING BREAK</i>
Tues	3/22	<u>BEFORE CLASS:</u> READ: Chapter 8: Analyzing Cells, Molecules and Systems TURN IN ON CANVAS: Problem Book Chapter 8; 1 - 21, 25 - 39, 46 - 59, 78 - 94, 105 - 112	<b>7. Designer Babies</b> - quiz on chapter 7 - lecture on chapter 8 - explore the problems/potential solutions
Thur	3/24	Read: <a href="https://www.nature.com/articles/d41586-019-00673-1">https://www.nature.com/articles/d41586-019-00673-1</a>	Paper Discussion #6: Cyranoski 2019

	<b>Date</b>	<b>To Complete BEFORE class</b>	<b>Class Topic</b>
Tues	3/29	<b>BEFORE CLASS:</b> READ: Chapter 12: Intracellular Compartments and Protein Sorting TURN IN ON CANVAS: Problem Book Chapter 12; 1-19, 24 - 35, 51 - 62, 73 - 76, 82 - 98,	<b>8. Animal Research</b> - quiz on chapter 8 - lecture on chapter 12 - explore the problems/potential solutions
Thur	3/31	Read: <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5684868/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5684868/</a>	Paper Discussion #7: Cheluvappa et al 2017
Tues	4/5**	Take home test #2 Chapters 5, 6, 7, and 8	Take home test #2 Chapters 5, 6, 7, and 8
Thur	4/7**	Take home test #2 Chapters 5, 6, 7, and 8	Take home test #2 Chapters 5, 6, 7, and 8
Tues	4/12	<b>BEFORE CLASS:</b> READ: Chapter 13: Intracellular Membrane Traffic TURN IN ON CANVAS: Problem Book Chapter 13; 1 - 19, 29 - 39, 48 - 58, 65 -	<b>9. Food Insecurity</b> - quiz on chapter 12 - lecture on chapter 13 - explore the problems/potential solutions
Thur	4/14	Read: <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7505491/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7505491/</a>	Paper Discussion #8: McLoughlin et al 2020
Tues	4/19	<b>BEFORE CLASS:</b> READ: Chapter 22: Stem Cells and Tissue Renewal	<b>10. Stem Cell Research</b> - quiz on chapter 13 - lecture on chapter 22 - explore the problems/potential solutions
Thur	4/21	Read: <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2726839/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2726839/</a>	Paper Discussion #9: Lo and Parham 2009
Tues	4/26	<i>SpARC</i>	<i>SpARC</i>
Thurs	4/28	Take home test #3 Chapters 12, 13 and 22	Take home test #3 Chapters 12, 13 and 22
Tues	5/3	Bring 1 hard copy of your personal statement and CV to class	CV/Personal statement/SpARC EC oral reports
WED	5/4	<i>Last Day of Classes</i>	<i>Last Day of Classes</i>