

BIO 216: Molecular Biology

Dr. Jennifer Larimore

Office: BSC 201W

Office number: 404-471-6270

E-Mail: jlarimore@agnesscott.edu

Office Hour: M/W 9 - 10AM or by appointment. Even if you are dropping in on office hours, send me an email so that there aren't any delays in the meeting.

Class Lecture: Tuesday/Thursday 8:30 AM - 9:45 AM Room 112 West

Lab: Tuesday 2-5 PM Room 206 West

Required Text and Materials:

1. *Molecular Biology*. AP (Academic Publishing) Cell Press. Second edition. David P. Clark and Nanette J. Pazdernik. ISBN number is 978-0-12-378594-7. Copyright 2013.

Course 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.

Course Objectives:

1. Create and execute systematic scientific inquiry. Using molecular biology techniques coupled with the scientific method, create inquiry-driven hypothesis to explore an unknown question.
2. Communicate science effectively. Students will read, understand, and present primary literature related to molecular biology topics covered in lecture.
3. Critically evaluate molecular biology research. Think critically and engage scientifically in regards to the lecture material, the lab material and the primary literature.

Credit and workload:

BIO 216 Lecture is a 3-credit course. In addition to 3 hours in-class time, you will be spending a minimum of 4-6 hours per week in preparation for our class sessions, including reviewing lecture material, completing reading assignments and answering discussion questions in writing before coming to class. BIO 216 Lab is a 1 credit course. In addition to the 3 hours in-class lab time, you will be spending a minimum of 2-4 hours per week in preparation for our lab sessions.

Lecture Grades:

Exams	200 points (2 x 100 points)
Paper Analysis.	50 points (10 x 5 points)
Article Present.	40 points (2 x 20 points)
DRQs	55 points (11 x 5 points)
Quizzes	20 points (10 x 2 points)
Total Lecture	365 points

LAB Grades:

Manuscript	100 points
Final Presentation	40 points
Manuscript Drafts	25 points (5 x 5 points)
Pre-lab Quizzes	30 points (6 x 5 points)
Total LAB Points	195 points

*additional points or assignments may be added by Dr. Larimore

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

Lectures and Class:

Class time will be interactive, therefore listening to the lecture AND reading the assigned chapters 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. Come prepared to participate in class discussions on both the text material and any assigned readings. There will be some in class assignments that will be graded.

Why a flipped classroom? Studies demonstrate that taking ownership of your learning and being able to take material at your own pace enhances your learning of the material. Molecular Biology has a lot of topics and experiments that allow for further exploration of the topic. So the lecture material covers the basics and we will learn how to apply that material in class.

Quizzes:

There will be a quiz for each assigned lecture and lab. The lecture quizzes will be on the power point lecture material. The quiz # listed on the syllabus corresponds with the lecture # of the videos on Moodle. There will be a lab quiz over the lab for that day every lab period.

Why quizzes? Studies demonstrate that studying in small chunks will help you retain more information and for a longer period of time than cramming for a test the night before. This is to help you avoid cramming for a test.

Exams:

There will be exams spaced throughout the semester. The exams will be written to assess your understanding of the information covered in class and your ability to apply and analyze the information. Be ready to design experiments to answer a question. Exams are cumulative and may contain lab material.

Why tests? To retain information! And to take that information one step further and apply it.

Directed Reading Questions (DRQs):

These function as review questions for each chapter and can assist you in learning the information covered in the lecture. They highlight what the professor believes is the important information in the chapter. Each DRQ will be posted to Moodle prior to the lecture. Answer these questions as you read the assigned chapters prior to lecture. Turn these questions in for 5 points per worksheet. No late work will be accepted for DRQs. Ever. So do not ask. DRQs are due the day before lecture at noon. Your answers MUST be in your own words. You cannot quote any sources. Your answers cannot be cut and paste from any sources. 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. There will be a spot on Moodle to turn in the DRQs.

Why DRQs? Studies demonstrate that studying in small chunks will help you retain more information and for a longer period of time than cramming for a test the night before. This is to help you avoid cramming for a test.

Article Presentation:

There will be assigned groups. These presentations are expected to be well prepared and be no shorter than 50 minutes. If it is less than 50 minutes, points will be taken off. The grading rubric for these presentations is on Moodle. You will be graded on Creativity, Organization, Scientific Content, and Preparation.

Why article presentations? Public speaking in a science field will be necessary, whether its to get a job or to discuss your findings at a meeting, or to recruit potential donors to a cause, public speaking in science is a skill that is absolutely necessary.

The group preparing the article presentation will need to create a google slides/keynote/PPT presentation. Load a copy of your presentation (saved as a PDF) to the google drive folder (link on Moodle) BEFORE your presentation. Your presentation should include the following three sections:

- a. Introduction section – give background information to help our class understand your topic. Why is this experiment important? What background information will help us understand what was done (reference the papers cited in the introduction)? State the hypothesis. Give data from at least 2 prior studies.
- b. Results section– the graphs, the tables, figures, etc - should include a figure legend and a figure title. Any time you present a piece of data, always explain what the audience is looking at (this is a western blot or images of a cell), what method was used to obtain the data (and explain it if we haven't covered it in class), and what the data mean (your interpretation), how does that tie back to the hypothesis, and why the data are important to the paper and our understanding. Each person in the group should present at least one figure. If there are not enough figures in a paper, look up figures from either previous research and present those in the introduction or look up figures from studies after the paper and present those in the conclusion.
- c. Conclusion section– simple statements to describe the key, take-away points from the experiment and their importance in the field of study. How did the study contribute to the hypothesis?

ANY information on your slide is FAIR GAME for a question. If you put it on a slide, BE ABLE TO EXPLAIN IT!! I will take off points if you cannot explain something on your slide. Things to

consider: less text is better, diagrams are always helpful, keep the background info relevant, keep all additional information relevant, if it's boring to you, it's boring to your audience. Additional information on the specifics of the presentation can be found on Moodle.

Articles:

A peer-reviewed articles from primary literature will be assigned each week for reading to accompany discussion of current research. Article analysis sheets will be due for each article at the beginning of those class periods, even for the groups presenting. The article analysis sheets should be typed and loaded to Moodle prior to class as a PDF with your last name and the date in file name. Failure to follow instructions will result in a loss of points.

Why article analysis? While it may seem like pointless task, especially if you never study any of these diseases, the overall skill of being able to digest a primary article is necessary in so many science fields. Scientific literature is almost its own language and being able to pick out the key information is a necessary skill in any science field.

Lab Course Work**General Lab Direction:**

We are analyzing if an endosomal vesicle associated protein complex (the BLOC-1 complex) and how that is impacted in Rett syndrome. ****UNDERSTAND** science is messy and rarely follows a schedule. Because this is an inquiry based lab, the dates in the syllabus are merely a suggestion. These dates will change.

PRE-Lab Quizzes:

You will have quizzes before a few of the labs.

Why pre-lab quizzes? So that you will be prepared for lab session by reading and understanding the lab protocol.

The lab manuscript:

At the end of the semester, you will write a manuscript with an title, abstract, introduction, a materials and methods section, a results section containing the data you obtained in lab, and a discussion section. You will be graded on appropriate use of scientific terminology, on construction of your report (it's overall structure), and the amount of information/appropriate information you include in your report. There will be a place on Moodle to submit this online. Submit a Word Doc with your last name in the file name.

WHY we are doing this? No matter what field of science you end up in, you will have to master the skill of scientific writing. Science doesn't do any good unless it is communicated with other scientist. Manuscripts are the primary tool for that communication.

You may work with your group to generate ideas. You may not copy another student's work. If you copy another student's work on a draft or on the final, you will receive a 0. You cannot copy directly from an external source. You must reword the source. Failure to reword the source will earn you a 0. You must cite the paper where the research actually demonstrates what you said - the first reference. Failure to use the first reference will result in major point deductions.

Rough drafts

Each section of the final lab manuscript including the figures are due throughout the semester for 5 points each. These are to be submitted on Moodle as a word doc with your last name as part of the file name. Before they are turned into me, a tutor at the CWS needs to review them. I will be checking with the CWS. If you did not go, you will not get full points.

The Format:

When a scientist writes up their results to publish in a journal, they have to follow that journal's style of manuscripts. We will practice that in this class. Your paper must follow the specifications for submission to Molecular Biology of the Cell (MBoC) for each section and for the references.

Focus on the section labeled: Preparing a manuscript submission for review: <http://www.molbiolcell.org/site/misc/ifora.xhtml#C2>

Tips: Remember that you are writing an introduction on material that I do my research on, so you cannot turn in something less than your full effort. As we go through the semester, each paper we read will be an example of how to write each of these sections. Pay close attention to each of these sections in the papers we read not only for class, but in HOW those sections are written.

Your lab report will contain the following elements worth 20 points each:

1. Abstract: a brief summary with 1-2 sentences of background information, the lack of knowledge that this will research will address, the hypothesis and a 1-2 sentences of the results summarized

2. Introduction. In this section you will need to do the following:

- A. Give the background information that is necessary to understand the results section
- B. Describe what is unknown about the field of study we are exploring and why these studies are important
- C. Give your hypothesis

3. Results (NOT JUST THE FIGURES AND FIGURE LEGENDS - IT IS MORE THAN THAT!!)

In This section you will need to do the following:

- A. Include your figures
- B. Describe the following for each figure:
 - a. In a few words, what method did you use to generate the figure?
 - b. In a sentence or 2, describe the goal of the experiment.
 - c. Describe your findings
 - d. Do these findings support your hypothesis or not?

4. Conclusion. In this section you will need to do the following:

- A. Recap the main findings from the experiments
- B. State if all the findings support your hypothesis
- C. Discuss how these findings impact the field of study –why are they important
- D. Suggest a natural next step from these experiments.

5. Materials and Methods. In this section you will need to do the following:

- A. Describe the materials used for the experiments, even if it was an experiment conducted by the instructor.
- B. Describe the methods used for the experiments, even if it was an experiment conducted by the instructor.

The SpARC Poster Presentation:

Your entire Lab group will be presenting your results.

Why a poster presentations? Public speaking in a science field will be necessary, whether it's to get a job or to discuss your findings at a meeting, or to recruit potential donors to a cause, public speaking in science is a skill that is absolutely necessary.

Each group will present for approximately 10 minutes. If you rush through this, people will not understand what you are saying. This is your lab grade. Take your time. Each person in the lab group is expected to do equal parts of the talking.

Your lab group will need to save a PDF version of your poster and upload it to Moodle. All group member names should be in the filename.

For EACH section – make sure you have rehearsed your section at least 4-5 times. Your information should be understandable to someone who DID NOT conduct this research, but someone who is familiar with science. Consider practicing your information with a non-science major friend and see if they understand your presentation. Your information should be well organized, well explained. You need a good balance of text and diagrams for each section!

ANY information on your slide is FAIR GAME for a question. If you put it on a slide, BE ABLE TO EXPLAIN IT!!

Introduction section – give background information to help our class understand your topic. Why is this experiment important? What background information will help us understand what was done? State the hypothesis.

Methods section – highlight the techniques used to gather the data. Explain what we are measuring and what we used for those measurements. You don't have to give step by step on how to do it, just what these are and why we are using them for our experiment. The underlying concept to cover is why were these techniques used and how will they address the question that is stated in the hypothesis?

Results – the graphs, the tables, etc - should include a figure legend and a figure title. Any time you present a piece of data, always explain what the audience is looking at, what you did to arrive at the data you are seeing (what method you used), and what the data mean (your interpretation) and why they are important.

Conclusion – simple statements to describe the key, take-away points from the experiment and their importance in the field of study. How did the study contribute to the hypothesis? Also, this should include future studies – what would propel this study if there was something more to be added to it.

Your group members will rate you on your effort after the presentations are complete. This rating can impact your grade.

Academic Policies:

e-mail:

Instructors will make announcements regularly via e-mail. It is your responsibility to check your Agnes Scott email account daily. When responding to a professor over email, take care that your email is professional. Examples here: <https://medium.com/@lportwoodstacer/how-to-email-your-professor-without-being-annoying-af-cf64ae0e4087#.jldd3bxes>

Technology:

If you are on your phone in class, it is my prerogative to answer your calls or texts as it is my class. 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. This would include refraining from 'surfing the web' during class. You will be asked to leave class or lab if you are using your cell phone or laptop to conduct business other than that of the class.

Plagiarism and Citations:

In your review article at the end of this class, you will need several outside sources. At no point can you copy work from another student. If you do so, you will receive a 0 on the assignment. If you use an outside source, you MUST reword the content from that source in your own words. If you do not reword the content from the outside source, you will receive a 0 on the assignment. If you use an outside source as a reference, make sure you use the first occurrence (first person to describe a mutation/animal model, etc – don't simply cite a review that mentions the first mutation).

Honor Code:

All work performed in this course must be in accordance with the Agnes Scott College Honor Code.

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. Students that receive accommodation checklists, please meet with me to discuss the provisions of those accommodations as soon as possible.

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.

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.

Deadlines:

Attendance and participation will be assessed periodically to determine your engagement and commitment to this class. Students are expected to attend all class periods, except in cases of documented illness or emergency. If a missed class cannot be avoided because of illness or emergency, it is **STRONGLY** recommended that you contact the instructor **IN ADVANCE**, or within 24 hours of the class period. Should an emergency or crisis arise, such that you miss class, you must provide legitimate documentation in order for the instructor to consider allowing you to make up missed work.

It is your responsibility to keep up with the class material. Thus, if you miss class, it is up to you to find out from a reliable source if you missed an assignment. It is also your responsibility to stay on top of presentation, quiz and exam deadlines. In-class assignments (such as the experimental design projects), presentations, and quizzes will **NOT** be available to make up later, unless you have a documented excuse, OR you have contacted me ahead of time.

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. We take your comments very seriously.

Academic Honesty:

The Agnes Scott College honor code embodies an ideal of character, conduct, and citizenship, and is an important part of the College's mission and core identity. This applies especially to academic honesty and integrity. Passing off someone else's work as your own represents intellectual fraud and theft, and violates the core values of our academic community. To be honorable, you should understand not only what counts as academic dishonesty, but also how to avoid engaging in these practices. You should:

- review each course syllabus for the professor's expectations regarding course work and class attendance.
- attribute all ideas taken from other sources; this shows respect for other scholars. 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.

- not falsify or create data and resources or alter a graded work without the prior consent of your professor. This includes making up a reference for a works cited page or making up statistics or facts for academic work.
 - not allow another party to do your work/exam, or submit the same or similar work in more than one course without permission from the course instructors. Cheating also includes taking an exam for another person, looking on another person's exam for answers, using exams from previous classes without permission, or bringing and using unauthorized notes or resources (i.e., electronic, written, or otherwise) during an exam.
 - not facilitate cheating, which can happen when you help another student complete a take home exam, give answers to an exam, talk about an exam with a student who has not taken it, or collaborate with others on work that is supposed to be completed independently.
 - be truthful about the submission of work, which includes the time of submission and the place of submission (e.g., e-mail, online, in a mailbox, to an office, etc.).
- You should understand that penalties result from dishonest conduct, ranging from failure of the assignment to expulsion from the college. You should speak with your professors if you need clarification about any of these policies.

	Date	Quiz	Reading Assignment	To Complete BEFORE class	Class Topic
Tues	1/8			Read Syllabus and DRQ	Syllabus and group meetings
TUES LAB	1/8	No quiz			No Lab
Thurs	1/10	L1 quiz		L1: BLOC-1 and DRQ	Group Meetings/Paper Assignments
Tues	1/15	L2 quiz	3	Lecture 2: DNA, RNA, and Protein and DRQ	Personalized Medicine and TED talk on genomics - Richard Resnick
TUES LAB	1/15	Lab quiz			RTT Background/Experimental Design - Group A
Thur	1/17		Chapleau 2009	Paper Analysis	Paper presented by Group B
Tues	1/22	L3 quiz	5 & 6	Lecture 3: Manipulating Nucleic Acids and PCR and DRQ	PCR in Crime Scenes
TUES LAB	1/22	Lab quiz			RTT Background/Experimental Design
Thur	1/24		Kee 2018	Paper Analysis	Paper presented by Group C
Tues	1/29	L4 quiz	10	Lecture 4: DNA replication and Cell Division and DRQ	Ted Talk - Can we eat to starve cancer - William Li
TUES LAB	1/29	Lab quiz			Prep Cells for WB/Manuscript and Poster Intro
Thur	1/31		Li 2012	Paper Analysis	Paper presented by Group F
Tues	2/5	Lab quiz			Run WB
TUES LAB	2/5	Lab quiz			Transfer to PVDF/Block/1°AB
Wednesday	2/6				Lab group pick a time to meet Dr. L to add 2°AB
Thur	2/7				Image WB
Tues	2/12	L5 quiz	11 & 12	Lecture 5: Transcription and RNA processing and DRQ	RNA has a story - Garry Wong
TUES LAB	2/12	Lab quiz		Materials and Methods Section for Manuscript Due	Image J WB /Stats on Image J data
Thur	2/14		Lombardi 2017	Paper Analysis	Paper presented by Group D
Tues *	2/19				Run WB
TUES LAB *	2/19				Transfer to PVDF/Block/1°AB
Wednesday	2/20				Lab group pick a time to meet Dr. L to add 2°AB
Thur *	2/21				Image WB
Tues	2/26	L6 quiz	13	Lecture 6: Protein Synthesis and DRQ	Ted Talk - Understanding Cancer through Proteomics - Danny Hills
TUES LAB	2/26		Test #1		Test #1 (Through Lecture 5)
Thur	2/28		Li 2016	Paper Analysis	Paper presented by Group E
Tues	3/5		<u>PEAK WEEK</u>	<u>PEAK WEEK</u>	<u>PEAK WEEK</u>
Thur	3/7		<u>PEAK WEEK</u>	<u>PEAK WEEK</u>	<u>PEAK WEEK</u>
Tues	3/12		<u>SPRING BREAK</u>	<u>SPRING BREAK</u>	<u>SPRING BREAK</u>
Thur	3/14		<u>SPRING BREAK</u>	<u>SPRING BREAK</u>	<u>SPRING BREAK</u>
Tues	3/19	L7 quiz	14 & 15	Lecture 7: Protein structure, function and proteomics and DRQ	GMOs/Genomics and Taste TED talk - Barry Schuler
TUES LAB	3/19	No quiz		Results Section of the Manuscript Due	Stats on Image J data/Make a figure/Conclusions for Poster - Group F
Thur	3/21		Meng 2016	Paper analysis	Paper presented by Group A

	Date	Quiz	Reading Assignment	To Complete BEFORE class	Class Topic
Tues	3/26	L8 quiz	16 & 17	Lecture 8: Transcriptional Regulation and DRQ	Gender Identification in Sports, Ted Talk Vera Pauw
TUES LAB	3/26	No quiz		Conclusion for the Manuscript due	Finalize poster/Practice Poster
Thur	3/28		Xu 2017	Submit poster for printing and paper analysis	Paper presented by Group B
Tues *	4/2	L9 quiz	19	Lecture 9: Analysis of Gene Expression and DRQ	CRISPR and Designer Babies TED talk - Paul Knoepfler
TUES LAB	4/2	No quiz		Introduction for the Manuscript due	Practice poster in front of the class
Thur	4/4		Chao 2012	Paper analysis	Paper presented by Group C
Friday	4/5				Scotties with Nerves Poster Presentation
Tues	4/9	L10 quiz	20 & 21	Lecture 10: Plasmids and Viruses and DRQ	Vaccines
TUES LAB	4/9	No quiz		Abstract for the Manuscript Due	Manuscript work
Thur	4/11		Moretti 2006	Paper analysis	Paper presented by Group D
Tues	4/16		26	Lecture 11: Molecular Evolution and DRQ	Molecular Evolution
TUES LAB	4/16	No quiz	Test #2		Cumulative Test #2
Thurs	4/18		Chahrour 2008	Paper analysis	Paper presented by Group E
Tues	4/23			SpARC	SpARC
Thurs	4/25				Peer-Review of the Manuscripts
Friday	4/26				Manuscript due at 11:00 AM on 4/26/2019
Tues	4/30				CV/Personal statement/SpARC EC oral reports
	5/1			Last Day of Classes	Last Day of Classes
Thurs	5/2			Reading Day and Senior Finals	Reading Day and Senior Finals