

BB 315/BI 315: Molecular Biology Laboratory, Spring 2018 3 credits

Students will participate in one Lecture/Discussion Forum session and two 3- hour lab sessions each week:

Lecture: Tuesday 4:00-4:50, LNC 368

Lab Section (24 students): Tuesday and Thursday 9-11:50am, ALS 0023

Tuesday and Thursday 1-3:50pm, ALS 0023

Prerequisites: BB 314 [C-], BI 314 [C-], BB 314H [C-], or BI 314H [C-].

Instructor:

Dr. Kari van Zee, Biochemistry-Biophysics Department, ALS 2141

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Office hours: Wednesday 11 am-1 pm, or by appointment

Research Faculty: Dr. Michael Freitag, Biochemistry-Biophysics Department

Email: freitagm@oregonstate.edu

TA: Allyson Erlendson, Biochemistry-Biophysics Department, ALS 2031

Email: erlendsa@oregonstate.edu

Office hours: Monday 9-11am, or by appointment

Course Information:

Molecular Biology Laboratory, BB 315/BI 315 is an intermediate-level laboratory designed for life science majors. By completing guided-research projects focusing on fundamental molecular biology concepts and essential technologies, participating students will explore the functional relationship between DNA sequence and gene products and the transmission of genetic information from storage through expression to function. Through laboratory projects, lectures, and journal-club style discussion forums of selected primary research papers, the course will introduce students to the design, expression, and use of recombinant proteins and how they are used in advancing the field of molecular biology and biochemistry. Students will attend two three-hour lab sessions each week and one lecture/discussion forum.

This course is designed to expose students to how research is performed, presented, and analyzed in the academic world. Our project this year will be developed in partnership with Dr. Michael Freitag and Allyson Erlendson, PhD candidate, in the Department of Biochemistry and Biophysics:

Molecular characterization of PRC2-mediated gene silencing in the filamentous fungi *Neurospora crassa*.

The formation of heterochromatin is crucial for cell differentiation, repression of repetitive DNA elements and protection of chromosome integrity. These processes involve transactions with nucleosomes, carried out by chromosome remodeling enzymes and are signaled by histone modifications. Polycomb Repressive Complex 2 (PRC2), functions as a chromatin silencing

complex catalyzing deposition of the repressive chromatin mark, trimethylated lysine 27 on histone H3, or H3K27me3. Using *in vitro* mutagenesis we aim to identify mechanistically important interactions of the PRC2 complex, assembling a more complete model of the PRC2 interaction network for the fungi, *Neurospora crassa*.

Learning Outcomes

Students will:

1. Design experiments including the proper controls to analyze gene expression, construct, express, and characterize recombinant proteins.
2. Compare different types of gene cloning methods, and identify strengths and limitations of each method.
3. Demonstrate quantitative skills by preparing accurately and reproducibly reagents and solutions for experiments.
4. Operate safely molecular biology laboratory equipment including micropipettes, thermocyclers, centrifuges, gel electrophoresis chambers, power supplies, incubators, and autoclaves.
5. Interpret and evaluate scientific papers related to the research project, analyzing both scientific methods as well as writing style
6. Develop an awareness of the major issues at the forefront of the discipline and discuss ethical issues in the molecular life sciences.
7. Communicate and present their work to both a science literate and science non-literate audience orally and in writing.
8. Recall and relate foundational molecular biology concepts and laboratory techniques to recent advances in basic research, medicine, and industrial applications.

Resources: Experimental protocols, reading lists, and resources will be posted on Canvas.

Readings: available through Canvas and the OSU library.

Attendance: This is a time intensive lab course aimed to expose students to a variety of techniques in the field of molecular biology. The research based nature of this course requires your presence in lab to move your project forward. Attendance to both lab and lecture are required.

More than two unexcused absences will result in failure of the course.

Evaluation of Student Performance:

Lab Participation (20%): Students are expected to attend every lab session, observe safety policies while working in the lab, demonstrate proper care of equipment and reagents, and be responsible for moving their research project forward. Points will be deducted for students who fail to follow safety guidelines, leave messes behind for TAs or another group to clean-up, or who do not display proper lab etiquette.

Deliverables/Pre-lab assignments (15%): Students are required to complete the required

safety training and pre-lab assignments on Canvas weekly. These assignments will test your knowledge on the protocol that will be performed, as well as concepts that will be utilized in the lab. Other deliverables will be assigned during lecture.

Notebook (20%): Each student will maintain a scientific laboratory notebook recording experimental design notes, procedures, calculations, data, and conclusions. You are expected to supply your own notebook and bring it to every class. Guidelines for keeping a scientific notebook will be provided in class. Notebooks will be submitted twice throughout the term for grading. **Due Thursday 4/26 after class and Monday 6/11 by 4pm to Kari's office ALS 2141.**

Proposal drafts and final copy (25%):

Introduction to problem/background (5%) **Due 5/4/2018 on Canvas**
Peer review (5%) **In class 6/5/2018**
Final Proposal (15%) **Due 6/11/2018 on Canvas**

Proposals are informative and persuasive writing aimed at convincing the reader to fund your research. Now that you have participated in primary research and you have been exposed to a variety of biochemical techniques, you will prepare an undergraduate research proposal describing the next steps you would take to complete your research project. The effectiveness of your proposal will depend on your ability to explain the nature, context and scope of your project.

Your final proposal will be a 2-3 page document (1 in margins, single-spaced, size 12 Times New Roman or 11 Arial) that addresses the following topics:

1. Your research question and project goal
2. A brief evaluation of the existing scholarly literature on your proposed research question
3. The methods and data you plan to employ to answer your research question
4. Limitations of the project
5. Expected results
6. An initial reference list or bibliography of scholarly sources you plan to use to conduct your research (not included in the 2-3 pages)
7. Timeline (not included in the 2-3 pages)

You will be provided with more detailed instructions and a grading rubric.

Journal Club (20%):

Journal Club Discussion Guide (10%) **Due before Discussions as upload to Canvas**
Journal Club Participation (10%)

An important component of the "practice of everyday science" is reading scientific articles published in peer-reviewed journals. The goals of journal club in this course are to help you 1) develop skills in critical thinking, 2) practice scientific journal article reading and learn how to extract information from a scientific paper, 3) make connections between the research presented in an article and its significance in the broader world, and 4) have fun learning about

research advances in a variety of fields.

Starting week 4, our weekly classroom meetings will be conducted like a journal club. All students are expected to read all of the articles and participate actively in the discussions. To prepare for the journal club discussions, each student will need to complete a journal club discussion guide ahead of the discussion and post this to Canvas before the discussion. Students must attend the journal club discussion session in order to receive points for the submitted journal club discussion guide and participation.

Teams of students will be formed at the beginning of the term. Each team will be responsible for preparing an explanation of a figure (assigned before class) from the paper. All members of the team are responsible for working together to determine the salient features of the figure/graph and present them to the class. Papers for journal clubs will be selected by the instructors. The first journal club during Week 4's lecture will also serve as an introduction into reading scientific literature.

Grading Criteria: The following grading scale points will be utilized to award letter grades:

93 – 100 points = A	73 – 76.9 points = C
90 – 92.9 points = A-	70 – 72.9 points = C-
87 – 89.9 points = B+	67 – 69.9 points = D+
83 – 86.9 points = B	63 – 66.9 points = D
80 – 82.9 points = B-	60 – 62.9 points = D-
77 – 79.9 points = C+	57 – 59.9 points = F

Personal Protective Equipment (PPE) Safety Requirements:

Close-toed shoes and full length pants, or their equivalent, are required in the lab. Additionally, students will wear lab coats, gloves, and protective eyewear while they work. Lab coats and safety glasses (splash resistant and UV protective) are available in the BB Teaching Lab or students may provide their own.

University Policies – A reminder:

Diversity Statement

The College of Science strives to create an affirming climate for all students including underrepresented and marginalized individuals and groups. Diversity encompasses differences in age, color, ethnicity, national origin, gender, physical or mental ability, religion, socioeconomic background, veteran status, sexual orientation, and marginalized groups. We believe diversity is the synergy, connection, acceptance, and mutual learning fostered by the interaction of different human characteristics.

Religious Holiday Statement

Oregon State University strives to respect all religious practices. If you have religious holidays that are in conflict with any of the requirements of this class, please see me immediately so that we can make alternative arrangements.

Statement Regarding Students with Disabilities

Oregon State University is committed to student success; however, we do not require students to use accommodations nor will we provide them unless they are requested by the student.

The student, as a legal adult, is responsible to request appropriate accommodations. The student must take the lead in applying to Disability Access Services (DAS) and submit requests for accommodations each term through DAS Online. OSU students apply to DAS and request accommodations at our [Getting Started with DAS](#) page.

The University student conduct code can be found at:

<http://oregonstate.edu/studentconduct/offenses-0>

Cheating or plagiarism by students is subject to the disciplinary process outlined in the Student Conduct Regulations.

Students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

- ◆ Cheating-use or attempted use of unauthorized materials, information or study aids
- ◆ Fabrication-falsification or invention of any information
- ◆ Assisting-helping another commit an act of academic dishonesty
- ◆ Tampering-altering or interfering with evaluation instruments and documents
- ◆ Plagiarism-representing the words or ideas of another person as one's own

Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct for disciplinary action.

Use of cellular phones is not permitted in the classroom or laboratory during lectures or exams.

“The goal of Oregon State University is to provide students with the knowledge, skill and wisdom they need to contribute to society. Our rules are formulated to guarantee each student's freedom to learn and to protect the fundamental rights of others. People must treat each other with dignity and respect in order for scholarship to thrive.

Behaviors that are disruptive to teaching and learning will not be tolerated, and will be referred to the Student Conduct Program for disciplinary action. Behaviors that create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Affirmative Action Office”