BB 315  Molecular Biology Laboratory  Spring 2021  3 credits

Course Description
Laboratory projects exploring the transmission of genetic information from storage to function will introduce students to fundamental molecular biology concepts and techniques, including isolation of DNA, construction of recombinant plasmids, quantification of gene expression in model organisms, polymerase chain reaction, and analysis of protein expression and subcellular localization. Lecture and lab.

Topics covered: This is an intermediate-level laboratory course designed for students in Biochemistry and Molecular Biology and other relevant life science majors. By completing guided 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 protein function. This course is designed to expose students to how research is performed, presented, and analyzed in the academic world. This year, our projects were developed in partnership with Dr. Michael Freitag (professor), Dr. Mareike Möller (post-doc), Dr. John Ridenour (post-doc), and Allyson Erlendson (PhD candidate), all in the Department of Biochemistry and Biophysics.

Instructors and GTAs:
Dr. Michael Freitag, Dept. of Biochemistry and Biophysics
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Dr. Kari van Zee, Dept. of Biochemistry and Biophysics
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Allyson Erlendson, Dept. of Biochemistry and Biophysics
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Alex Eddins, GTA eddinsa@oregonstate.edu
Felisha Imholt, GTA imholtf@oregonstate.edu

Lecture time: Tuesday 4-4:50 pm  Zoom (remote synchronous delivery)
Lab Sections: ALS 0023  Instructor/TA
Monday and Wednesday  1-3:50 pm  Erlendson/van Zee
Tuesday and Thursday  9-11:50 am  van Zee/Imholt
Tuesday and Thursday  1-3:50 pm  Freitag/Eddins

Office hours: to be announced and posted with Zoom links on Canvas.
Prerequisites: BB 314 Cell and Molecular Biology with a minimum grade of C-

Laboratory sessions blended or 100% remote:
Blended = synchronous sessions with students alternating in-person and remote by zoom. Week 1 will be remote and synchronous for all students so that we can establish best practices after spring break. During week 1, instructors will provide a schedule for in-person rotation. Students will be assigned to attend in person Day 1 or 2 of each week. Students who have registered for 100% remote sections will attend synchronously all term by Zoom.

Location: ALS 0023 for in person sessions. Watch the “How to enter the BBTL lab and safety video”.
Minimum technology and devices needed in BB 315
- **Reliable internet connection** and **video capability** to participate in synchronous remote lab and lecture sessions.
- **Personal cellphone or tablet with camera** that can be mounted on cellphone or tablet tripods (provided). This will allow the “in person” student to show the remote team member(s) the experimental set-up and carry them to different work stations.
- **OSU WiFi** Students will connect to the **OSU Wi-Fi**.
- **Charging cord** for cellphone or tablet
- **Ear buds** or headphones to cut down background noise when in lab breakout rooms.
- **Laptops**: to install SnapGene, perform literature searches, and access data bases of genome sequences.

Due to the ongoing COVID-19 pandemic, instructors, teaching assistants, and students in BB 315 will follow the guidelines of Oregon State University which are aligned with directives from the Governor, the Oregon Health Authority and local health authority.

**Prioritize Safety and Wellness**: As an instructional team, we prioritize the safety and wellness of all members of our community. We expect that you as students also prioritize the safety and wellness of all members of our OSU community as well as members of your family, friend network, and community at large. Our goal is to help students in BB 315 gain hands-on laboratory experience in biochemistry and molecular biology. We will be as flexible as possible in accommodating each student’s needs.

**Travel**: For those considering personal travel over Spring Break and during the term or those of you travelling with athletic teams, please review the [travel advisory](https://travel.state.gov/travelers/travel-advice) issued by the states of Oregon, California and Washington which discourages non-essential travel. Students returning from out-of-state or out-of-country travel should quarantine for at least 6 days and then take a COVID-19 test and receive negative results before returning to in person lab. **Week 1 laboratory sessions will be remote, synchronous sessions for all students as we assume students will travel over spring break. In-person lab rotations will begin week 2.**

**Laboratory Modality**: To meet physical distancing requirements, laboratory sessions will include a combination of alternating in-person + synchronous Zoom sessions. Students will be assigned to teams of 2-3, and one member of the team will attend lab in person while the other 1-2 team members zoom in synchronously. The instructors will provide a schedule for team rotations. Custom plexiglass stations have been installed in the BB Teaching Lab and physical distancing will be maintained per OSU policy outlined below. **Requesting alternate modality**: If a student has concerns that in-person lab sessions will compromise their safety and well-being or if a student is not able to come to campus, please contact Kari van Zee to request 100% remote access.

Enroll in TRACE [https://trace.oregonstate.edu/osu/consent](https://trace.oregonstate.edu/osu/consent) We strongly encourage you to enroll in OSU’s TRACE program.

**Illness**: Stay home if you are ill and notify the instructional team. This also applies if your roommate is ill. Attend lab remotely. We will move your experiments forward.

**Exposure or possible exposure to COVID-19**: If a student thinks they have been exposed to COVID-19, 1) self-quarantine for quarantine for at least 6 days and then take a COVID-19 test and receive negative results before returning to in person lab and monitor for symptoms throughout this time; 2) [immediately inform your instructor and course coordinator Kari van Zee](https://hr.oregonstate.edu/covid-19-resources/positive-case-communication). We will determine if other members of that section also need to self-quarantine due to possible exposure. If a student tests positive for COVID-19, then please 1) inform your instructor and Kari van Zee immediately and 2) complete the Positive COVID-19 Communication form at [https://hr.oregonstate.edu/covid-19-resources/positive-case-communication](https://hr.oregonstate.edu/covid-19-resources/positive-case-communication). The OSU-Corvallis campus point of contact is Jenny Haubenreiser [jenny.haubenreiser@oregonstate.edu](mailto:jenny.haubenreiser@oregonstate.edu)

**Clear Communication**: All members of the course will need to be vigilant about their own health as well as nimble in responding to changes in the community health situation. We may need to change the modality of delivery to 100% remote learning with little advanced notice. We will clearly communicate all changes through Canvas announcements and emails. We expect students to communicate changes in their own situations with the instructional team.
OSU COVID POLICIES
To contribute to the health and safety of all OSU community members during the ongoing COVID-19 pandemic, and to align with federal and state regulations, executive orders, and guidance, the university has adopted two policies all community members are expected to observe:

(1) Policy on Face Coverings in Public and Common Settings (https://policy.oregonstate.edu/UPSM/04-041_COVID19_face_covering)
This policy requires faculty, staff, students and visitors across all OSU locations to use masks or cloth face coverings, or an appropriate alternative, when in enclosed OSU public and common areas, unless an exception is met; and

This policy requires faculty, staff, students and visitors across all OSU locations to maintain six feet of physical distance between others when in enclosed OSU public and common areas, unless an exception is met.

Please review and familiarize yourself with these policies and supplemental guidance (https://covid.oregonstate.edu/sites/covid.oregonstate.edu/files/face_covering_guidance_6-3-20.pdf).

Thank you for contributing to the health and safety of the community. If you have questions about these policies, please contact me or you may submit further inquiries to the Coronavirus Question form (https://oregonstate.qualtrics.com/jfe/form/SV_cTpAHJzw4P3zyQd).

Course content Spring 2021:
A course map of projects will be posted separately on Canvas and in the lab. Assignment and deliverable due dates will be posted on Canvas and integrated with the Canvas calendar. Due dates are subject to change if we encounter experimental set-backs or COVID-related delays.

Safety and Best Laboratory Practices—ongoing throughout the term.

Project 1: Genome Annotation
Students will learn how to use sequence analysis tools, specifically SnapGene, common biological data bases, and molecular visualization software by annotating ~10 kb genome segments of a widely used model organism, the filamentous fungus Neurospora crassa. They will next analyze the homologous gene in Fusarium graminearum, a common wheat and maize pathogen, and our experimental model this year.

Project 2: Molecular cloning
Students will learn how to design primers and carry out gene cloning by fragment assembly to build plasmids that allow for the deletion or “tagging” of specific genes in the plant pathogenic fungus, Fusarium graminaerum.

Project 3: Immunoblot characterization of Chromatin Proteins
Students will learn how to evaluate the expression of endogenous and recombinant proteins in fungal strains through SDS-PAGE and immunoblotting.
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. Use databases, computational tools and other online resources to analyze and interpret genomic sequences.

7. Develop an awareness of the major issues at the forefront of the discipline and discuss ethical issues in the molecular life sciences.

8. Recall and relate foundational molecular biology concepts and laboratory techniques to recent advances in basic research, medicine, and industrial applications.

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

We are providing access to SnapGene software for the length of the spring term. Instructions on how to install are provided through Canvas.

Participation: Active participation in “lab” and lecture activities is required throughout duration of each laboratory session in order to pass the class. Remote students are expected to attend the entire session synchronously and assist their team members in the experiments. Remote students should not be participating in another activity that requires their attention (such as driving) unless prior arrangement has been made. Students are expected to communicate with the instructional team to arrange for excused absences from regularly scheduled laboratory and lecture meetings or to notify of illnesses or emergencies preventing lab attendance.

**Students who miss more than three lab sessions without prior arrangement and approval with the instructor of that section (not lab partners) will fail the course** and should withdraw from the course before the week 10 deadline and take in a year in which they can fully participate.
**Evaluation of Student Performance:**

**Lab Safety Training and Best Laboratory Practices (10%):** Students must complete the assigned safety training and observe safety policies while working in the lab. They must demonstrate proper care of equipment and reagents and be responsible for moving their projects forward. Assignments will include completion of OSU on-line safety training modules, and safety quizzes.

**Participation and Active Engagement (10%)**

Students are expected to participate actively in lab sessions and discussion groups, during lecture discussions. Students must also complete the course questionnaire by the first lecture.

**Pre-lab assignments (25%):** Students are required to complete pre-lab assignments and submit them via Canvas by the stated deadlines. These assignments will test students’ knowledge of protocol that will be performed, as well as concepts that will be utilized in the lab. Pre-labs are due every Monday by 9 am (except Week 1) for all students in all sections.

**Notebook (25%):** Each student will maintain a digital scientific laboratory notebook recording experimental design notes, procedures, calculations, data, and conclusions. Students are expected to upload a pdf of their complete notebook three times during the term. The entire notebook to date should be uploaded as a pdf. Students may use a notebook platform such as “Benchling” but they do not have to (see Canvas for instructions). Guidelines for keeping a scientific notebook will be provided in class. If student teams maintain a team notebook, it should be clear through color-coded entries which student entered what. Each team member is expected to contribute equally to the notebook.

**Genome Annotation Project Milestones/Deliverables (15%):** Assignment and submission instructions will be posted on Canvas.

- **Deliverable 1:** BLASTN, BLASTX and SnapGene map
- **Deliverable 2:** Peer evaluation of one annotated gene with the assigned region
- **Deliverable 3:** Final annotation report and BLASTP analysis for all proteins  
  *(requires use of SnapGene; access via BB 315 provisional license, free of charge)*

**Final Report on the assigned gene for deletion or tagging (15%):** Assignment details will be posted on Canvas.

**Grading Scale:**

A (94-100%), A- (90-93%), B+ (87-89%), B (84-86%), B-(80-83%), C+ (77-79%), C (74-76%), C- (70-73%), D+ (67-69%), D (64-66%), D- (60-63%), F <59%
University Policies

Academic Calendar
All students are subject to the registration and refund deadlines as stated in the Academic Calendar: [https://registrar.oregonstate.edu/osu-academic-calendar](https://registrar.oregonstate.edu/osu-academic-calendar)

Statement Regarding Students with Disabilities
Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at [http://ds.oregonstate.edu](http://ds.oregonstate.edu). DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Student Conduct Expectations link: [https://beav.es/codeofconduct](https://beav.es/codeofconduct)

Reach Out for Success*
University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it’s important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success at [oregonstate.edu/ReachOut](http://oregonstate.edu/ReachOut). If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255)

Diversity: 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 Holidays: 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.