

Biology 312L (Fall 2020)

Molecular Biology Lab – HHMI Phage Research

Lab:	F 1:00 – 4:00 pm (online)
Instructor:	Dr. Christine Byrum
Email:	byrumc@cofc.edu
Phone:	(843) 953-7176
Office Hours:	Zoom sessions by appointment (just email me to schedule)
Prerequisites/Co-requisites:	Co-enrollment or completion of Genetics (BIOL 305) and co-enrollment or completion of Molecular Biology (BIOL 312).

Course Overview:

This class will be presented online synchronously via Zoom sessions. In collaboration with the Howard Hughes Medical Institute (HHMI) students in this upper level undergraduate course will participate in bacteriophage genomics research! This is part of a national effort to discover, isolate, sequence, and annotate genomes of previously unidentified viruses. You'll participate in authentic hands-on research combining molecular genetics and computational approaches for large-scale analysis of bacteriophage genomes. We will also discuss key techniques used in molecular research. In this course students will:

- Annotate gene sequences in a viral genome.
- Use bioinformatic resources to predict functional roles of viral genes.
- Perform a comparative analysis using several related viral genomes.
- Prepare a manuscript for publication in Microbiology Resource Announcements
- Design primers to amplify specific genes using PCR.
- Review key molecular biology lab techniques such as DNA extraction, PCR, gel electrophoresis, Sanger sequencing, and cloning.
- Learn how to perform and interpret sequence alignments and phylogenetic analysis using DNA/protein sequences.
- Contribute to scientific discovery!

Course Objectives/Student Learning Outcomes:

- 1) Demonstrate the ability to use and explain modern molecular biology techniques.
- 2) Demonstrate understanding of developing hypotheses and designing experiments.
- 3) Communicate, analyze, and discuss genome features detected during annotation.
- 4) Demonstrate ability to evaluate/apply information presented in scientific journals.
- 5) Demonstrate the ability to key online resources (e.g. BLAST, GenBank, ORFfinder, ClustalW, MEGA, etc.) needed for molecular analyses.

Required Supplies:

- Computer/laptop
- SEA-PHAGES Bioinformatics Guide and Phage Discovery Guide – These are available online free of charge at:

<https://seaphagesbioinformatics.helpdocsonline.com/home>

<https://seaphagesphagediscoveryguide.helpdocsonline.com/home>

Course Policies

Attendance: Regular online participation is critical. If you are absent, your research cannot proceed and this could affect class progress on our projects. If you are unable to attend a class due to sickness or other legitimate excuse, be sure to inform me ahead of time. Also, check with me about the materials you've missed so that you don't fall behind and can make up any missing assignments. If you have a religious conflict, please let me know Accommodations can be made.

Continuity of Learning: Due to social distancing requirements, this class will include a variety of online and technology enhanced components to reinforce continuity of learning for all enrolled students. Before the drop/add deadline, decide whether the course plan outlined in this syllabus matches your own circumstances.

OAKS and Other Websites: I will regularly post information, including grades, the syllabus, and other class materials on OAKS throughout the semester. I will contact the class using Zoom and we will also utilize the HHMI SEA-PHAGES website (phagesdb.org).

Contacting the instructor: If you have questions or would like to chat, feel free to email, telephone, or schedule a Zoom office hour session. I respond to telephone messages/emails within 24 hours during the week and within 48 hours on the weekend. To schedule a Zoom appointment, contact me by email, telephone, or during/after class. Questions are highly encouraged and I'm happy to hear from you!

Classroom Courtesy: Switch off cell phones or other disruptive devices during class. Do not text, check emails, watch videos, shop, or engage in any other disruptive behaviors. Focus on class activities. Exceptions to this policy will be made in situations such as spouses anticipating the birth of a child or serious emergencies. Permission to leave an electronic device on should be obtained before class.

Recording of the Class: During the semester, I may record class sessions via either voice and/or video. By attending and remaining in the course, you consent to being recorded. Recorded class sessions are for instructional use only and may not be shared with anyone not enrolled in the class.

Assignments/Grading:

Course grades will be calculated based on the following:

Participation/Research Productivity	25%
Quizzes/Homework	55%
Annotation Paper	10%
Virus Presentation	10%

Participation/Research Productivity: A critical portion of your grade will be based on participation and research productivity. This grade is determined based on three criteria: A) regular attendance; B) research focus (evidence that lab work is performed correctly and that you made progress in the project or in troubleshooting if obstacles are encountered); and C) your ability to interact productively with others, actively contribute during discussions, and maintain a positive attitude. Aspects that will be considered include the following:

- Are you curious and interested in communicating discoveries?
- Have you become familiar with what is already known about the subject?
- Do you doggedly pursue the question and logically troubleshoot if things go wrong?
- Are you able to work independently?
- Do you help others in the class?
- Do you ask good questions during discussions?
- Can you develop and clearly state hypotheses?
- Can you clearly describe results and ideas to others?
- Can you correctly interpret outcomes of experiments?

Quizzes/Homework: Students will complete assigned exercises to be turned in at the beginning of the next class. Lab assignments will be announced in class and/or placed on OAKS prior to the week they are due. These assignments may involve performing searches using bioinformatics tools, reading papers and/or preparing for discussions, completing worksheets, etc.

Annotation Paper: One of our major projects this semester involves identifying all of the genes present in the genome of soil virus “Netyap” and carefully characterizing this viral genome. At the conclusion of this project, you will be expected to submit a draft version of a paper summarizing the class findings as well as the final revised version. This should be carefully formatted following author guidelines outlined for the journal *Microbiology Resource Announcements*. Your papers will later be used to produce the class’ final manuscript for submission to this journal.

Presentation: At the beginning of the semester each student will select a date to do a short presentation about viruses (~5 minutes). You can describe recent findings in the news, present historical information about, describe mechanisms of viral activities,

discuss an industrial use of viruses, etc. The information presented should be, in some way, relevant to the molecular biology of viruses. Prepare your talk as a PowerPoint, VoiceThread, or iMovie presentation. These talks will be presented at the start of each class and you should also submit a copy to be posted on OAKS. Feel free to discuss this with me ahead of time if you're unsure whether your topic is suitable. Be sure that your topic differs from previously covered information.

Grading Scale:

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

Academic Integrity:

You are expected to behave in an honest and responsible manner. Violations of the honor code are offensive and will generally be dealt with severely. We will adhere to the following policy as quoted from the Honor Council's recommended guidelines:

"Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when suspected, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student's actions are related more to misunderstanding and confusion will be handled by the instructor. The instructor designs an intervention or assigns a grade reduction to help prevent the student from repeating the error. The response is recorded on a form and signed both by the instructor and the student. It is forwarded to the Office of the Dean of Students and placed in the student's file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This status indicator will appear on the student's transcript for two years after which the student may petition for the XX to be expunged. The F is permanent.

Students can find the complete Honor Code and all related processes in the Student Handbook at:

<http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php> ."

Other Considerations:

Inclement Weather, Pandemic, or Substantial Interruption of Instruction:

If we need to evacuate or experience disruptions due any of the listed situations, I will announce a detailed plan for any changes in modality. Be sure to take your computer and any other course materials with you. All students must have access to a computer equipped with a web camera, microphone, and internet access. If this is a problem, resources are available to provide you with these essential tools.

Center for Student Learning: Students are encouraged “to utilize the Center for Student Learning’s (CSL) academic support services for assistance in study strategies, speaking/writing strategies, and course content. This office offers tutoring, study strategy appointments, supplemental instruction, and workshops. Services are available at no additional cost. For more information regarding the CSL, see their website at <http://csl.cofc.edu> or call (843) 953-5635.”

Accommodations for Students with Disabilities: If you need accommodations because of a disability, please talk to me about this during the first week of classes or as soon as you have been approved for these services so that we can address this. For more information on Disability Services, please refer to the following website: <http://disabilityservices.cofc.edu>

Veterans/Active Duty Personnel: Veterans and active duty personnel with special circumstances (e.g. upcoming deployments, drill requirements, disabilities) are welcomed/encouraged to communicate these, in advance if possible, to the instructor.

Inclusion: I will gladly honor your request to address you by the name and gender pronouns of your choice. Please advise me of this at your earliest convenience via your college-issued email account or in person. For more resources, see <http://gender-sexuality-equity.cofc.edu>.

Food/Housing Insecurity: If you are not economically secure in food and housing, the College has assistance programs. Contact the Dean of Students directly, or I will be happy to provide confidential assistance.

Lab Schedule:

Date/Day	Topic
Aug. 28 - F	Introduction to HHMI and Phage Lab Annotation Project
Sept. 4 - F	Identifying Start Sites
Sept. 11 - F	BLAST and GenBank
Sept. 18 - F	Functional Annotation
Sept. 25 - F	Comparative Analysis
Oct. 2 - F	tRNAs/Frameshift Mutations/PECAAN
Oct. 9 - F	Annotation Papers
Oct. 16 - F	Intro to PCR and Primer Design
Oct. 23 - F	DNA Extractions and PCR
Oct. 30 - F	Evaluating Results – Gel Electrophoresis and Sequence Analysis
Nov. 6 - F	Cloning
Nov.13 - F	Sequence Alignment
Nov. 20 - F	Phylogenetic Analysis
Dec. 4 - F	Summary Lab

** Schedule may vary subject to scheduling changes and other modifications as needed.*