Phage Hunters Advancing Genomics and Evolutionary Science (PHAGES)
Introductory Biology Research Laboratory I – Spring 2021
BIOL 1750.501, MW 12:00-2:50pm and other times as needed
BIOL 1750.502, MW 3:00-5:50pm and other times as needed

INSTRUCTOR: **Dr. Lee Hughes**
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Office Hours: By appointment

TEACHING ASSISTANTS:

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Textbook: **"Phage Discovery Guide - *Streptomyces*" by the Howard Hughes Medical Institute (manual provided online for student use)**

PHAGE Laboratory Courses:

The Phage Hunters Advancing Genomics and Evolutionary Science (PHAGES) experience at UNT is offered in association with the Howard Hughes Medical Institute's Science Education Alliance. PHAGES is an undergraduate research experience in genomics for undergraduate students. UNT students who participate in this program will enroll in a two course sequence (BIOL 1750 for 2 SCH in the first semester and BIOL 1755 for 1 SCH in the following semester) in which research activities on bacteriophage genomics will be conducted. These two laboratory courses will serve as replacements for the normal BIOL 1760 laboratory in the biology or biochemistry. **By participating in the PHAGES course for both semesters you will become published in a scientific genomic database and potentially become an author on scientific articles about the phages on which you work.**

Due to the nature of experimental research, the course syllabus schedule for this laboratory will be more flexible than in a normal course, and the schedule may change as experimental progress requires.

Course Materials:
All course materials are available through Canvas at unt.instructure.com.

Attendance Policy:
Attendance and on-time arrival are critical at all scheduled laboratory meetings. Communication with your TA is key in situations where you are unable to attend lab to ensure continued progress on your sample. Remote attendance in the lab may be an option when medically necessary but must be approved by the instructor.

COVID-19 impact on attendance
While attendance is expected as outlined above, it is important for all of us to be mindful of the health and safety of everyone in our community, especially given concerns about COVID-19. Please contact me if you are unable to attend class because you are ill, or unable to attend class due to COVID-19 including symptoms, potential exposure, pending or positive test results, or if you have been given specific instructions to isolate or quarantine from a health care provider or a local authority. It is important that you communicate with me prior to being absent so I may make a decision about accommodating your request to be excused from class.

If you are experiencing any symptoms of COVID-19 please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Hotline at 844-366-5892 or COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure. While attendance is an important part of succeeding in this class, your own health, and those of others in the community, is more important.

Laboratory Goals:
The goals for the first semester are as follows. Each student will:

- Learn the microbiological techniques necessary to cultivate bacteria and bacteriophage.
- Isolate a unique bacteriophage from an environmental sample of their choosing.
- Obtain a high-titer lysate of their isolated phage.
- Obtain an electron micrograph of their isolated phage.
- Obtain a clean DNA sample for their isolated phage and create a restriction digest.

Based on the electron micrographs, restriction digests, and quality of DNA preparations, the class will identify the DNA samples to be submitted for genome sequencing. At least one genome sequence will be obtained for study in the second semester of the laboratory sequence.

Laboratory Safety:
Following all laboratory requirements is important for the safety of you and your classmates. You must comply with all safety requirements as outlined during the lab safety training.

Physical distancing and face coverings are components of creating a safe laboratory environment given current circumstances. Face coverings are required in all UNT facilities. Students are expected to wear face coverings during this class. If you are unable to wear a face covering due to a disability, please contact the Office of Disability Access to request an accommodation. UNT face covering requirements are subject to change due to community health guidelines. Any changes will be communicated via the instructor.

STUDENTS WITH DISABILITIES:
The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with an accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information see the Office of Disability Access website at http://www.unt.edu/oda. You may also contact them by phone at 940-565-4323.

GRADING:

Your course grade will consist of the following elements:

- 20% Pre-lab Activities/Quizzes
- 20% Laboratory Notebooks (averaged from multiple checks throughout the semester)
- 20% Concept Quizzes
- 5% Short Presentation (3-5 minute Powerpoint presentation highlighting the characteristics of your isolate)
- 15% Final Class Presentation and written report (5-8 minute presentation detailing semesters work; paper to follow scientific paper format as instructed)
- 20% Archiving of samples and electronic database completion*
- 100% Overall % Grade *(Letter grades will be assigned on a typical scale: 90+=A, 80-89=B, 70-79=C, 60-69=D, <60=F)*

*Must be received for all successful phage isolations to obtain passing grade in course.

TENTATIVE LABORATORY SCHEDULE
INTRODUCTORY BIOLOGY RESEARCH LABORATORY I

[Students in a lab section will be divided into two group. Except where noted below, students in Group A will meet the first 1 hour and 20 minutes of the scheduled lab period, and students in Group B will meet the last 1 hour and 20 minutes of the scheduled lab period.]

Meeting	Date	Topic	Readings
1	Jan. 11 (Zoom virtual meeting)	Course overview; Safety; Introduction to Phage Hunting.*	SEA PHAGES Welcome, Lab Basics, Phage basics, Module 1
2	Jan. 13	Laboratory Techniques and Sampling Methods. Begin Enrichment.	Protocol 5.1, Protocol 5.5 (Day 1), Module 2
	Jan. 18	NO LAB – Martin Luther King Jr. Day	
3	Jan. 20	Harvest enriched samples and perform plaque assay.	Protocol 5.5 (Day 2), Protocol 5.3, Host basics
4	Jan. 25	Pick plaques, perform spot assays from enrichments.	Protocol 5.4, Protocol 5.6,
5	Jan. 27	Perform Phage Titer assay on purified phage.	Protocol 6.1 and Protocol 6.2
6	Feb. 1	Continue Phage Titer for purification as needed.	
7	Feb. 3	Continue Phage Titer for purification as needed	
8	Feb. 8	Harvest 1-plate lysate. Spot titer lysate.	Protocol 6.3, Protocol 6.4
9	Feb. 10	Calculate amounts for webbed plates.	Protocol 7.1
10	Feb. 15	Set up Webbed Plates from Lysate of Known Titer. Begin Lysogen testing.	Protocol 11.1
11	Feb. 17	Harvest Multi-plate lysate. Continue lysogen streak plates.	

12	Feb. 22	Set up Phage Titer of High Titer Lysate. Start lysogen broth.	
13	Feb. 24	Calculate phage titer. Repeat as necessary. If HTL, name phage and enter into PhagesDB. Verification of potential lysogens. Set up lysate for DNA prep.	Protocol 7.2 Protocol 11.2
14	Mar. 1/3	Extract and purify DNA**	Protocol 9.1
15	Mar. 8/10	DNA quantification; restriction analysis**	Protocol 10.1
16	Mar. 15/17	Agarose gel electrophoresis of restriction analysis**	Protocol 10.2, Protocol 10.3
17	Mar. 22	Analysis of restriction results and comparison with known actinobacteriophage in database. Calculate remaining DNA volume and amount in ug. Short Presentation Details.	Protocol 10.4
18	Mar. 24	Host range testing.	Protocol 11.5
19	Mar. 29	Host range results. Electron microscopy. (Zoom)	Protocol 8.1a, Protocol 8.1b
20	Mar. 31	Archive Samples. Prepare short presentations.	
21	Apr. 5 (Zoom meeting)	Present short presentations*. Assign Final Presentation and Paper.	
22	Apr. 7	Complete PhagesDB archiving entry. (remote activities)	Protocol 7.3
23	Apr. 12/14	Work on final presentation and paper (remote activities)	
24	Apr. 19 (Zoom meeting)	Present Final Presentation*	
25	Apr. 21	Final Paper due.	

*All students in section meet virtually on Zoom for entire lab period (2 hours 50 minutes)
**Students in Group A will meet entire lab period (2 hours 50 minutes) on Monday. Students in Group B will meet entire lab period on Wednesday.