

Phage Hunters Advancing Genomics and Evolutionary Science (PHAGES)

Introductory Biology Research Laboratory I – Fall 2019

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

BIOL 1750.503, MW 9:00-11:50am and other times as needed

INSTRUCTOR:

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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 for this laboratory will be more flexible than in a normal course. **Attendance is required** at all scheduled laboratory meetings and **on-time arrival** is critical (three tardies will equal one absence in grading). Excessive absences or tardies may result in additional grade reduction. As well, students should expect to attend **additional open laboratory times** as needed each week depending on the progress of their particular samples.

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 through a “Phage Olympics” the 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.

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:

- 9% Attendance (-3% per absence or -1% per tardy)
- 15% Daily Procedures (due at start of class)
- 20% Laboratory Notebooks (5 checks x 4% each)
- 16% Concept Quizzes (4 x 4% each, 3 announced 1 class meeting in advance, 1 pop quiz)
- 5% Phage Olympics 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 to obtain passing grade in course for

TENTATIVE LABORATORY SCHEDULE INTRODUCTORY BIOLOGY RESEARCH LABORATORY I

| <u>Meeting</u> | <u>Date</u> | <u>Topic</u> | <u>Readings</u> |
|----------------|-------------|--|---|
| 1 | Aug. 26 | Course overview; Safety; Laboratory Techniques and Sampling Methods. Begin Enrichment. | Sea Phages Welcome, Lab Basics, Phage basics, Host basics, Protocol 5.1 and Protocol 5.5 |
| 2 | Aug. 28 | Harvest enriched samples. Sampling instructions for Direct Plating. | Protocol 5.3 |
| | Sep. 2 | LABOR DAY – no class (Collect new soil sample) | |
| 3 | Sep. 4 | Pick plaques, perform spot assays from enrichments. Direct plating of weekend samples | Protocol 5.4, Protocol 5.6, Protocol 5.2 |

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| 4 | Sep. 9 | Perform Phage Titer assay on purified phage. | Protocol 6.1 and Protocol 6.2 |
| 5 | Sep. 11 | Continue Phage Titer for purification as needed | |
| 6 | Sep. 16 | Continue Phage Titer for purification as needed | |
| 7 | Sep. 18 | Harvest 1-plate lysate. Titer lysate. | Protocol 6.3, Protocol 6.5 |
| 8 | Sep. 23 | Titer lysates or spot tests. Set up Empirical Test. | Protocol 6.4 |
| 9 | Sep. 25 | Set up Multi-plate lysate. | Protocol 7.1 |
| 10 | Sep. 30 | Harvest Multi-plate lysate | |
| 11 | Oct. 2 | Titer High Titer Lysate | |
| 12 | Oct. 7 | Extract and purify DNA | Protocol 9.1 |
| 13 | Oct. 9 | DNA quantification; restriction analysis | Protocol 10.1 |
| 14 | Oct. 14 | Agarose gel electrophoresis of restriction analysis | Protocol 10.2, Protocol 10.3 |
| 15 | Oct. 16 | Analysis of restriction results and comparison with known actinobacteriophage in database. | Protocol 10.4 |
| 16 | Oct. 21 | Begin additional analyses on sample if regular analysis complete | |
| 17 | Oct. 23 | Electron microscopy | Protocol 8.1a, Protocol 8.1b |
| 18 | Oct. 28 | Catch up day if needed/TBA | |
| 19 | Oct. 30 | Prepare short presentations | |
| 20 | Nov. 4 | Catch up day if needed/TBA | |
| 21 | Nov. 6 | Present Phage Olympics Short Presentation | |
| 22 | Nov. 11 | Submit DNA to Sequencing Center | |
| 23 | Nov. 13 | Write up Archiving reports/Archive Samples | Protocol 7.2, Protocol 7.3 |
| 24 | Nov. 18 | Continue phage experiments. Write up Research Papers/prepare Final Class Presentations | |
| 25 | Nov. 20 | Continue phage experiments. Write up Research Papers/prepare Final Class Presentations | |
| 26 | Nov. 25 | Wrap up phage experiments. Write up Research Papers/prepare Final Class Presentations. Clean lab. | |
| 26 | Nov. 27 | Work on Research Papers (no class meeting) | |
| 27 | Dec. 2 | Final Class Presentations. | |
| 28 | Dec. 4 | End of Semester Wrap up | |