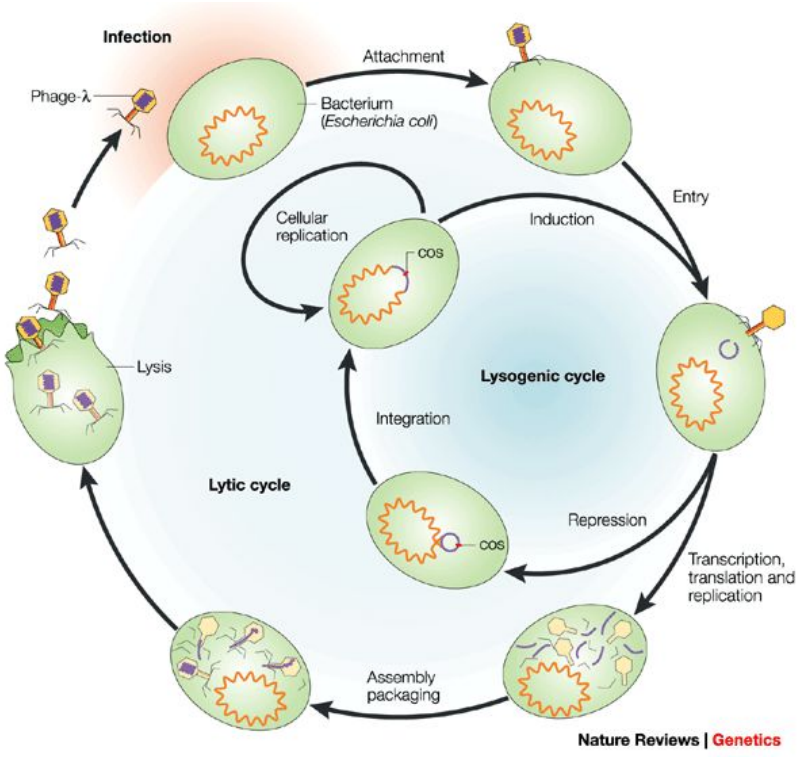
BIOL 312L - 05 Molecular Biology Lab

Spring 2020



Course Meetings

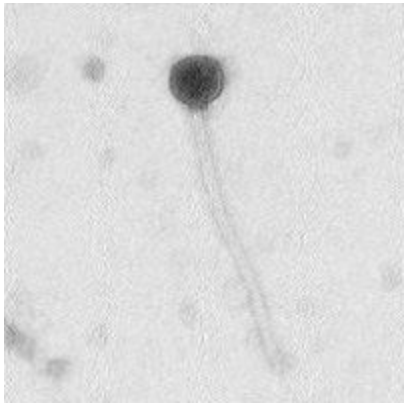
Day: Thursday
Time: 2:00 - 5:00pm
Location: RITA 145

Instructor

Dr. Chris Korey
Department: Biology
Office: RITA 207
Email: koreyc@cofc.edu
Phone: 3-7178

Office Hours

Location: RITA 207
Time: Mondays 1-3pm
Note: I realize you may have class during this time, so before/after class and by appointment are also alternatives



Welcome to Molecular Biology lab! This semester you will be participating in a course-based undergraduate research experience focused on understanding the biology and evolution of bacteriophage viruses that infect particular bacterial hosts. The goal of this lab is to help you develop strong lab skills in basic bioinformatics and a variety of wet lab techniques used in academic and industry research labs. You will be working on two projects this semester that have never been completed before so the outcomes are unknown at the start. Successful completion of these projects will result in several research outcomes that will be useful to the scientific community. By the end of the semester you will…

- Be an author on at least one fully annotated viral genome submitted to GenBank
- Submit research on a new phage promoter to a national synthetic biology database
- Be an author on a genome announcement describing your newly annotated phage genomes

Course Learning Outcomes

By the end of this course, you will:

- Demonstrate the ability to create and communicate scientific research findings in written and oral formats.
- Understand the principles of and demonstrate proficiency in:
    - Finding and using basic bioinformatic file types such as fastA
    - Using bioinformatic research tools such as BLAST, Promoter Identification Algorithms, and other NCBI Bioinformatic Resources.
    - Comparative Genomics using Phamerator and other genome comparison tools
    - The annotation of genes within a prokaryotic viral genome
    - Prokaryotic promoter identification and function
    - Oligonucleotide design and ordering
    - Pipetting
    - Restriction enzymes, plasmid ligation and cloning
    - Basic Sterile Technique
    - Bacterial Transformation and Plating
    - Reporter Plasmid Expression Analysis
    - DNA Mini-Preparation
    - Determining DNA Concentration
    - Gel Electrophoresis (Agarose)
    - Polymerase Chain Reaction (PCR)

Readings

- There is no text book for the course. All required readings will be available in OAKs. I will provide paper copies of all readings the week prior to our discussions to save you from printing them out. *It is important that you bring your annotated copies of the readings to class to refer to during our discussions.*

Attendance

Because this class is a research based course, your contributions to each class meeting will be essential. For that reason, I expect you to attend all class meetings—which includes showing up on time and remaining until class is over. You are responsible for all the work we do on the day of your absence. Showing up more than 15 minutes late to class will be considered an unexcused absence.

Assignments

Each Assignment in this course will provide you with the opportunity to develop and demonstrate your proficiency in a variety of Molecular Biology skills.

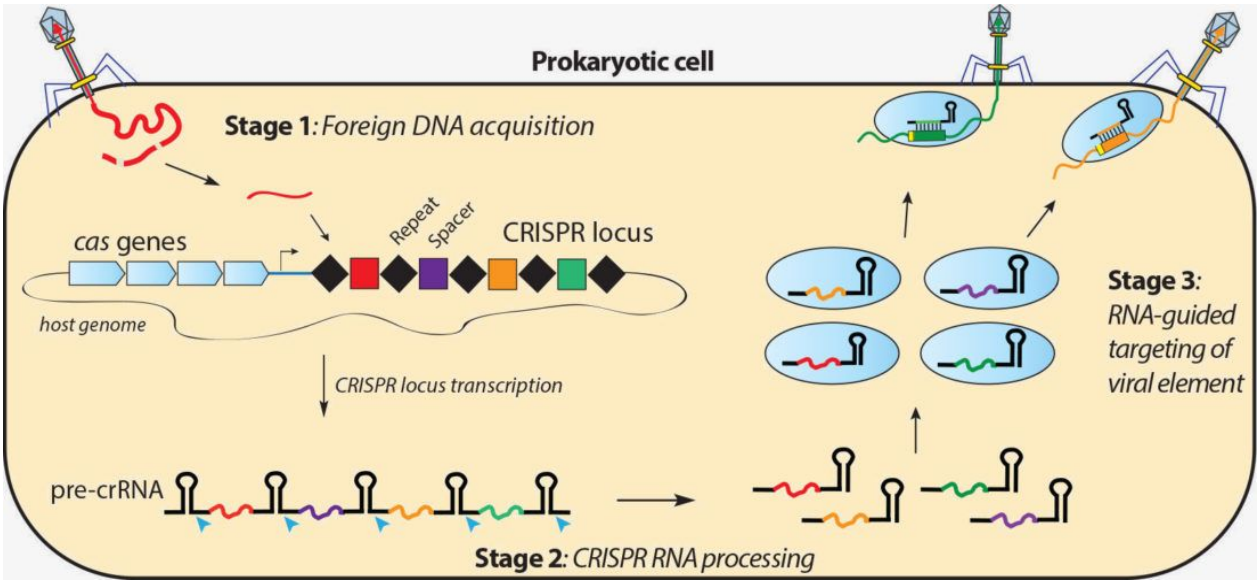
Phage Genome Annotation Research: In the first half of the course we will be annotating the genomes of one bacteriophage, Pinkcreek, that were identified by Majesty Mason at Xavier University of Louisiana. This project is part of the SEAPHAGES undergraduate research program funded by the Howard Hughes Medical Institute and run by the Hatfull Lab at the University of Pittsburgh. You will be working in groups to complete the genome annotation and produce a complete file for submission to GenBank. This will be the creation of new data that will contribute to our understanding of bacteriophage biology and evolution. Completion of this project will build skills in basic bioinformatics.

Genome Announcement: You will complete a genome announcement that describes your genome annotation research. Students who submit these will become authors on the genome announcement that will be submitted as a Microbiology Resource Announcement for publication by the American Society of Microbiology

Promoter Identification and Analysis: In the second half of the course you will be working in groups of two and identifying/analyzing the function of a possible prokaryotic promoter from your genome sequences. The data that you generate will be submitted to the Registry of Standard Biological Parts, which is used for synthetic biology projects. You will be submitting both a written summary of your research results as well as presenting this in an oral format to the class. Completion of this project will build skills in basic wet lab techniques that are used in all research labs that use Molecular Biology.

Pre-Class Quizzes: At the beginning of most classes we will take a short quiz on the material we covered in the previous class. This will allow you and me to see where clarifications are needed on material we covering.

CRISPR Paper Discussion: Many key molecular biology technologies, such as restriction enzymes or CRISPR gene editing, came from understanding the basic biology of virus - bacterial host interactions. We will read the original three papers that identified what the basic biological function of CRISPRs is before they become the biotechnology tool that is in the news today.



Course Meetings

BIOL 312L Lab Schedule

Lab Day 1 (1/9) Introduction to Phage Biology
Lab Day 2 (1/16) Phage Protein Function; Introduction to Genome Annotation (Meeting in RITA 200)

Pinkcreek Genome Annotation Research Project

Lab Day 3 (1/23) Genome Annotation and Bioinformatics (Meeting in RITA 200)
- Pre-Class Quiz 1

Lab Day 4 (1/30) Genome Annotation and Bioinformatics (Meeting in RITA 200)
- Pre-Class Quiz 2

Lab Day 5 (2/6) Genome Annotation and Bioinformatics (Meeting in RITA 200)
- Pre-Class Quiz 3

Lab Day 6 (2/13) Final Annotations and Genome Announcement (Meeting in RITA 200)
- Pre-Class Quiz 4

Pinkcreek Promoter Functional Analysis Research Project

Lab Day 7 (2/20) Promoter Function; Choice of Promoters for Analysis; Oligo Design
- Pre-Class Quiz 5
- CRISPR Paper 1

Lab Day 8 (2/27) GGA Ligation, Transformation, Plating
- Pre-Class Quiz 6

Lab Day 9 (3/5) Analysis of pClone Red Expression and Data Analysis
- Pre-Class Quiz 7
- CRISPR Paper 2

Lab Day 10 (3/12) DNA Mini-preparation and PCR Reactions for Insert Confirmation
- Pre-Class Quiz 8

Spring Break (3/19)

Lab Day 11 (3/26) Gel Electrophoresis and Analysis
- Pre-Class Quiz 9
- CRISPR Paper 3

Lab Day 12 (4/2) Lab Presentation of Promoter Analysis Research
- Pre-Class Quiz 10

Final Semester Housekeeping and Practical Exam

Lab Day 13 (4/9) Genome Announcement Final Drafts; Genome GenBank File Submissions; Exam Review
Lab Day 14 (4/16) Lab Practical Exam

Our Classroom Community Strives to be Fully Inclusive

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

Preferred Name and Pronoun Information: I will gladly honor your request to address you by the name and gender pronouns of your choice - mine are he/him/his. Please advise me of this early in the semester via your college-issued email account or during office hours so that I may make the appropriate notation on my class list.

This course will provide equal access.

- I am happy to work with all students to ensure that they have equal access to the educational experience of this class. Any student eligible for and needing accommodations because of a disability is requested to speak with the me during the first two weeks of class or as soon as you have been approved for services so that reasonable accommodations can be arranged.

- The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services/SNAP located on the first floor of the Lightsey Center, Suite 104 (http://disabilityservices.cofc.edu/for-faculty/faqs.php). Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me one week before accommodation is needed.

- This College abides by section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act. If you have a documented disability that may have some impact on your work in this class and for which you may require accommodations, please see an administrator at the Center of Disability Services/SNAP, 843-953-1431 or me so that such accommodation may be arranged

Physical and Mental Health Resources

At the college, we take every students' mental and physical wellbeing seriously. If you find yourself experiencing physical illnesses, please reach out to student health services (843.953.5520). If you find yourself experiencing any mental health challenges (for example, anxiety, depression, stressful life events, sleep deprivation, and/or loneliness/ homesickness) please consider contacting either the Counseling Center (professional counselors at http://counseling.cofc.edu or 843.953.5640) or Students 4 Support (certified volunteers through texting "4support" to 839863). You can also visit both on campus on the 3rd floor of Robert Scott Small for the Counseling Center or the 3rd Floor of the Stern Student Center for the Students 4 Support (12 to 4:30 pm). These services are there for you to help you cope with difficulties you may be experiencing and to maintain optimal physical and mental health.

Life-College Balance and Self-Care

Whether it is family and relationship problems, working nearly full-time, depression, anxiety, problems related to alcohol or other drug use, sexual assault and/or the death of family and friends, I am aware of and sympathetic to the fact that college students experience these and other challenges that make it difficult to focus on academics. If you experience one or more of these things during our class and you are struggling to

complete coursework, please communicate with me. There are numerous resources that I can recommend to you and, to an extent, I can work with you on deadlines.
Depending on what you are going through and the extent to which it is affecting your life, withdrawing from the class is sometimes the best option—Friday, March 13th is the deadline for withdrawing from full semester classes. Regardless of your circumstances, please reach out to me or somebody else for support.

Food and Housing Resources

Many CofC students report experiencing food and housing insecurity. If you are facing challenges in securing food (such as not being able to afford groceries or get sufficient food to eat every day) and housing (such as lacking a safe and stable place to live), please contact the Dean of Students for support. Also, you can go here to learn about food and housing assistance that is available to you. In addition, there are several resources on and off campus to help. You can visit the Cougar Pantry in the Stern Center (2nd floor), a student-run food pantry that provides dry-goods and hygiene products at no charge to any student in need. Please also consider reaching out to Professor ABC if you are comfortable in doing so.

How does the Honor Code apply to this course?

- 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 grade 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. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

- Students should be aware that unauthorized collaboration--working together without permission-- is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted.

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