

## SYLLABUS

### MOLECULAR BIOLOGY LAB (BIOL312L)

#### PHAGE GENOMICS RESEARCH

##### BACKGROUND

THE **HOWARD HUGHES MEDICAL INSTITUTE** (HHMI) SELECTED THE COLLEGE OF CHARLESTON AS ONE OF TEN COHORTS OF SCHOOLS TO BE MEMBERS OF THE **NATIONAL GENOMICS RESEARCH INITIATIVE** OTHERWISE KNOWN AS PHAGE HUNTERS.

**PHAGE HUNTERS** IS THE FIRST MAJOR INITIATIVE FROM HHMI'S **SCIENCE EDUCATION ALLIANCE**. THE PROGRAM CREATES **AUTHENTIC HANDS-ON RESEARCH** OPPORTUNITIES FOR STUDENTS.

##### STUDENT SCIENTISTS

STUDENTS WILL PARTICIPATE IN **BIOLOGICAL INVESTIGATION** THROUGH A RESEARCH PROJECT IN BACTERIOPHAGE GENOMICS. GENOMICS COMBINES EXPERIMENTAL GENETICS AND COMPUTATIONAL APPROACHES FOR **LARGE-SCALE ANALYSIS** OF THE BIOLOGICAL INFORMATION CONTAINED IN **DNA SEQUENCES**.

##### PHAGE IS THE RAGE

BACTERIOPHAGES ARE VIRUSES THAT INFECT BACTERIA. THEY ARE CONSIDERED THE MOST ABUNDANT BIOLOGICAL ENTITIES ON EARTH. THEIR ENORMOUS DIVERSITY AND NUMBER MAKE THEM IMPORTANT MODELS FOR THE STUDY OF GENE STRUCTURE, FUNCTION AND REGULATION, POPULATION GENETICS, AND EVOLUTION. IN ADDITION, THEY ARE EMERGING AS IMPORTANT TOOLS IN BIOTECHNOLOGY.

##### LOCATION

RITA Molecular Biology Lab Room 145  
MONDAY, TUESDAY, or WEDNESDAY 12:15-3:15.



##### INSTRUCTOR

ANA ZIMMERMAN ([zimmermana@cofc.edu](mailto:zimmermana@cofc.edu)).

OFFICE HOURS: Monday and Wednesday 9-11 RITA 125  
AND BY APPT.

##### PREREQUISITES

CO-ENROLLMENT OR COMPLETION OF GENETICS (BIOL305) AND CO-ENROLLMENT OR COMPLETION OF MOLECULAR BIOLOGY (BIOL312).

##### MOLECULAR BIOLOGY – THE FUN NEVER ENDS!

OVER THE SEMESTER STUDENTS WILL:

- COLLECT ENVIRONMENTAL SAMPLES.
- ISOLATE PHAGES FROM COLLECTED SAMPLES.
- USE PCR AND RESTRICTION ENZYMES TO IDENTIFY DIFFERENT VIRUSES.
- VISUALIZE VIRUSES BY ELECTRON MICROSCOPY.
- PREPARE VIRAL DNA FOR SEQUENCING.
- SEND PURIFIED VIRUSES FOR WHOLE GENOME SEQUENCING BY NEXT GENERATION ILLUMINA TECHNOLOGIES.
- ANNOTATE AND COMPARE THE SEQUENCED GENOMES UTILIZING BIOINFORMATICS.
- COLLABORATE WITH OTHER SCHOOLS IN THE HHMI NETWORK ON AN ONLINE FORUM.
- UPLOAD THE VIRAL SEQUENCES TO PUBLICLY ACCESSIBLE DATABASES.
- PRESENT FINDINGS AT HHMI CONFERENCE.
- CONTRIBUTE TO SCIENTIFIC DISCOVERY!

## STUDENT LEARNING OUTCOMES

DEMONSTRATE THE ABILITY TO USE AND EXPLAIN MODERN MOLECULAR BIOLOGY TECHNIQUES.

DEMONSTRATE AN UNDERSTANDING OF DEVELOPING HYPOTHESES AND DESIGNING EXPERIMENTS.

COMMUNICATE, ANALYZE, AND DISCUSS EXPERIMENTAL RESULTS.

DEMONSTRATE THE ABILITY TO EVALUATE AND APPLY INFORMATION PRESENTED IN SCIENTIFIC JOURNALS.

## GRADE DISTRIBUTION:

<b>REQUIREMENT</b>	<b>% GRADE</b>
PARTICIPATION/ATTENDANCE	10
MIDTERM AND FINAL EXAMS	20
WEEKLY ASSIGNMENTS	50
NOTEBOOK	10
<u>GROUP PRESENTATIONS OF PHAGE LITERATURE</u>	<u>10</u>
<b>TOTAL</b>	<b>100</b>

THE MOST IMPORTANT COMPONENT OF TO ANY LEARNING EXPERIENCE IS A POSITIVE ATTITUDE. SCIENCE IS A LIFELONG CURIOSITY. MY HOPE IS TO GUIDE HANDS ON LEARNING AND DISCOVERY ON YOUR LIFE JOURNEY IN THE SCIENCES. STUDENTS GRADES WILL BE BASED ON PARTICIPATION, EVIDENCE OF WORK ACCOMPLISHED, MAINTAINING A LABORATORY NOTEBOOK, AND ABILITY TO READ AND DISCUSS SCHOLARLY ARTICLES.

WE ARE EMBARKING ON A REAL RESEARCH PROJECT INVOLVING COLLABORATORS ACROSS THE COUNTRY, AS YOU WILL SOON COME TO APPRECIATE WE ARE PART OF SOMETHING LARGER THAN JUST OUR CLASS.

**WEBSITE:** WE WILL ROUTINELY USE HHMI'S WEBSITE PHAGESDB.ORG AS WELL AS OUR CLASS WEBPAGE ON OAKS.

### ADDITIONAL LAB HOURS

YOU WILL OCCASIONALLY NEED TO COME TO THE LAB BETWEEN CLASSES. WE WILL MAINTAIN AN OPEN LAB TIME, AND ALSO POST TIMES WHEN THE INSTRUCTOR WILL BE AVAILABLE TO HELP YOU AND WHICH WILL NOT INTERFERE WITH OTHER CLASSES. YOU SHOULD RECORD ALL WORK IN YOUR NOTEBOOK, INCLUDING THE DATES AND TIMES YOU ARE IN THE LAB.

### ATTENDANCE

OBVIOUSLY YOUR WORK CANNOT GO ON WHEN YOU ARE NOT PRESENT. EXCUSED ABSENCES (EITHER EMERGENCY OR KNOWN IN ADVANCE) MUST BE OFFICIALLY DOCUMENTED. UNEXCUSED ABSENCES WILL RESULT IN LOWER PARTICIPATION GRADES.

GRADING OF PARTICIPATION WILL BE ASSESSED BASED ON THE FOLLOWING CRITERIA. YOUR PRESENCE AND POSITIVE ATTITUDE IN CLASS IS A MAJOR FACTOR IN PARTICIPATION. TO ENGAGE AND BE PRESENT. TO EXHIBIT RESEARCH HABITS OF MIND, WHICH INCLUDE, BUT ARE NOT LIMITED TO:

- INTRINSIC CURIOSITY ABOUT THE WORLD / INTEREST IN COMMUNICATING DISCOVERIES
- FAMILIARITY WITH WHAT IS ALREADY KNOWN
- WILLINGNESS TO FAIL MULTIPLE TIMES BEFORE GIVING UP
- INDEPENDENCE AND OBJECTIVITY
- ASKING GOOD QUESTIONS (EVERYONE NEEDS TO PARTICIPATE IN THE LAB DISCUSSIONS)

PARTICIPATION WILL ALSO BE ASSESSED BY THE DEVELOPMENT OF YOUR RESEARCH SKILLS, REGARDLESS OF LABORATORY BENCHMARKS THAT HAVE BEEN ATTAINED, INCLUDING:

- CRITICAL EVALUATION OF EXISTING EXPLANATIONS
- DISTINGUISHING RELIABLE OBSERVATIONS FROM THE UNRELIABLE AND THE ABILITY TO DEAL WITH AMBIGUITY OR CONFLICTING RESULTS
- DESIGN OF EXPERIMENTS THAT CAN BE INTERPRETED
- SKILL IN EXECUTING EXPERIMENTS
- MANIPULATION OF HYPOTHESES USING NEW INFORMATION
- COMMUNICATION OF RESULTS AND IDEAS

### **NOTEBOOK**

YOU WILL BE REQUIRED TO KEEP A DETAILED RECORD OF ALL THAT YOU DO IN THE PHAGE LAB. THIS IS REAL RESEARCH THAT WILL ONE DAY BE PUBLISHED, AND YOUR PHAGES WILL ULTIMATELY BE ARCHIVED IN A NATIONAL PHAGE REPOSITORY, YOU HAVE A RESPONSIBILITY TO PROPERLY DOCUMENT YOUR EXPERIMENTS.

### **RELIGIOUS HOLIDAYS, STUDENT ATHLETES, AND STUDENTS WITH DISABILITIES**

STUDENTS WITH SPECIAL REQUIREMENTS ARE ENCOURAGED TO SEEK OUT ACCOMMODATIONS FROM THE COLLEGE AND ARE ENCOURAGED TO NOTIFY YOUR INSTRUCTOR (DR. Z.) SO THAT YOUR NEEDS CAN BE MET.

### **ACADEMIC DISHONESTY**

CHEATING OF ANY KIND, INCLUDING PLAGIARISM, WILL NOT BE TOLERATED. IF YOU THINK IT'S A BAD IDEA, IT PROBABLY IS. AS A VETERAN FACULTY MEMBER OF THE COLLEGE OF CHARLESTON HONOR BOARD I WOULD NOT LIKE TO SEE ANYONE IN MY CLASS IN AN HONOR BOARD HEARING EVER. THE HONOR BOARD HEARINGS ARE NOT FUN FOR ANYONE INVOLVED SO LET'S KEEP IT FUN. MORE IMPORTANTLY, OUR INTEGRITY IS THE ONLY THING WE TRULY OWN. HAVING INTEGRITY IS A REWARD OF BEING A GOOD PERSON AND IT IS FUN, EVEN MORE FUN THAN MOLECULAR BIOLOGY, FOR WHICH THE FUN NEVER ENDS.

### **FINALLY**

PLEASE BE ASSURED THAT I WANT EACH AND EVERY STUDENT TO REACH THE GOALS THAT THEY SET FOR THEMSELVES. IF YOU FIND YOURSELF HAVING UNDUE DIFFICULTY WITH ANY PORTION OF THE MATERIAL IN THIS COURSE PLEASE MAKE AN APPOINTMENT WITH ME FOR ADDITIONAL HELP.