**Biology 690 Syllabus**

**Spring, 2020**

This course will meet TTh 9:30-10:45 AM in Wilson Hall room 133. It is anticipated that the enrollment will be 5-15 students all of whom will have some background in microbiology and/or molecular biology. The class will be largely discussion with only occasional (and brief) lectures. Course topics will be studied primarily in papers from current journals and review articles. In addition we will do some computer genome annotation and you will build a simple evolutionary tree for a protein of your choice. The class is timed to coincide with the time of the Department of Microbiology seminars and we will attend some of their seminars and discuss them.

**Prerequisites.** One of the following: a course in microbiology, a course in molecular biology numbered above 300, or research experience in microbiology or molecular biology.

**Goals.** You should acquire skill in reading and evaluating original research in microbiology particularly bacterial genetics and the interaction of bacteria with eukaryotes. You will learn to analyze bacterial genomes using various computer programs. You will learn how to acquire knowledge and insights from research seminars. You will learn how to give a brief presentation of a research topic.

**Format.** Classes will consist of discussion lead by the professor or a student who has prepared to take the lead for that topic. Each student will be expected to contribute to the discussion during each class period and generally students will be called on in rotation during the class. .

**Grades.** Grades will be based on class participation (1 point per discussion class, total 32 points), computer analysis of genome sequences project (32 points), class presentation (13 points) and the final exam (23 points). Final grades will be 100-93 A, 92-90 A-, 89-88 B+,87-83B, 82-80 B-, 79-75 C+, 75-71 C, 70 C-, 69D+, 68-60D, below 60 F. Participation grades will be given each month to each student (and more often to those who are having difficulty with this aspect of the class). The final exam will consist of papers to be analyzed and discussed.

**Honor Code.** All students are expected to follow the guidelines of the UNC honor code. In particular, students are expected to refrain from "lying, cheating, or stealing" in the academic context. If you are unsure about which actions violate that honor code, please see me or consult [**http://honor.unc.edu/students/index.html**](http://honor.unc.edu/students/index.html).

Tentative schedule1

DATE TOPIC

Jan. 9 Introduction

Jan. 14 Bacterial genetics general considerations

Jan. 16 Luria and Delbruck paper

Jan. 21 Bacterial DNA binding proteins review

Jan. 23 Links between biochemistry and genetics Rhizobium EPS paper

Jan. 28 Links between biochemistry and genetics Rhizobium EPS paper

Jan. 30 Sigma factors and regulation of transcription

Feb. 4 Sigma factors and regulation of transcription

Feb. 6 Interaction of a regulatory protein with DNA Winans paper

Feb. 11 Protein secretion book chapter

Feb. 13 Protein secretion book chapter

Feb. 18 Regulation by small RNAs

Feb. 20 Regulation at the level of translation PNAS paper

Feb. 25 Rewrite of PNAS paper and computer work

Feb. 27 Genetics of *E. coli* pathogenesis

March 3 Micro seminar J. Vogel 1131 Bioinformatics

March 5 computer analysis and comparison of genes

March 10 Spring break

March 12 Spring break

March 17 Computer analysis of DNA sequences2

March 19 papers with problems

March 24 Sequence analysis

March 26 Evolution of bacteria Lenski papers

March 31 Sequence analysis

April 2 *Vibrio fisherii* symbiosis with squid, swap annotations

April 7 Building trees and sequence analysis

April 9 Building trees and sequence analysis

April 14 Student presentations3

April 16 Student presentations

April 21 Student presentations3

April 23 Summary

May 1 FINAL EXAM 8 AM

1 The schedule will be modified to allow us to attend some seminars in the Department of Microbiology but their seminar schedule is not yet available. Modifications may also be necessary for other reasons. Students will informed of any modifications as soon as they are determined to be necessary.

2 We will carry out a part of the annotation of a newly sequenced bacterial genome. Each student will search out and annotate a group of genes having a particular predicted function. This will increase your understanding of gene structure and evolution. In addition you will learn useful computer skills for examining genes and thinking about gene function.

3 Each student will give a short presentation on a topic of his/her choice. The topic must be cleared with Dr. Matthysse by April 7.