Biology 192, Phage Bioinformatics, Spring 2012

General Course Information

This handout contains important information about this course; please read it carefully.

The Bio 192 websites: Biology Dept web site; WU Blackboard; the SEA wiki (www.hhmi.org/seawiki). All readings, problem sets, etc will be posted on both the Biology site and Blackboard. The lab manual is on the SEA wiki.

Course meeting times: Tuesday 1-4 and Thursday 1-3. Lectures and software introductions will be in Eads 116; lab sessions in Eads 116 and Eads 013.

I. Instructor information

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Course TA’s

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Dr. Elgin and Dr. Shaffer will have office hours by appointment. Most weeks there will be time for discussion and questions during the regularly scheduled and open hour lab time, but questions outside of class are welcome.

II. Required Materials:

The Howard Hughes Medical Institute Science Education Alliance (HHMI SEA) lab manual will be available on-line.

Students will be asked to use a proper backup policy of all data. Server space will be available as one location where files may be copied. Students may also bring their own hardware (i.e. portable hard drive or thumb drive) for use as a secondary backup. Appropriate computers will be available in Eads 116 and 013. If you prefer, we can load the needed software on to your computer. Consult with Dr. Shaffer for assistance in this regard.
Bio 192 Schedule, Spring 2012

Finishing

1/17 T  Discussion: Review of last semester’s accomplishments (KH); review of final papers, goals for the coming semester (SCRE). (Be prepared to discuss papers on 1/26.)
Lecture: Review structure of DNA; DNA replication (SE).
Reading: Binder Part 2: Analyze, Section I - Finishing, Part A. Be sure to look at the web sites that show animations of DNA replication.
Assignment: Problem set #1 on DNA replication, PCR and DNA sequencing (preparation for Quiz #1 on 1/31).

1/19 Th  Lecture: PCR; Sanger & next gen sequencing (video on chemistry) (SCRE).
Lab: DNA assembly activity (enter results/conclusions in lab notebook). (SCRE)
Lecture: Introduction to Genome Assembly and Consed (CDS).
Reading: K Mullis, (1990) Sci American 262: 56-65 (RR)

1/24 T  Reading Discussion: Mullis paper. RR due. (SCRE & KH discussions)
Lecture: Watch video on 454 sequencing.
Demo: show use of virtual machine, storage of items, data in/out of VM, lab manual/notebooks, conventions for naming files and version control. (CDS)
Lab: Finishing your draft sequence – The Consed program (Lab manual: Analyze Section I - Finishing, Part B) (CDS). Enter comments/observations in lab notebook. Be sure to capture your BLAST results in a screenshot similar to Fig 20 (page 23) and place in your lab notebook; capture the final blast result at step C.2.c as well. Answer question 1 on page 27 in your notebook. Save all BLAST results as individual files. Continue with Analyze Section I C as time permits.
Reading: Binder, Finishing, Part B – Read prior to coming to class!

1/26 Th  Discussion: Rewriting your fall semester papers. (Final rewrite due 2/2.)
Lab: Assembly and phage structures info session (CDS). Work through Sec. I C; cluster assignment using your practice genome Thia. Enter your results into your lab notebook. (CDS)
Reading: Binder, Cluster assignment, Part C.

1/31 T  Quiz #1 (KH)
Lecture: Using Consed for quality assessment/improvement. (CDS)
Lab: Quality analysis of individual phages. Worksheet assignment. (CDS)

2/2 Th  Lecture: Thinking about genes: transcription (SCRE)
Lab: Complete tagging and analysis of your phage. (CDS)
Assignment: Rewrite of fall semester papers due
Assignment: Problem set #2 on transcription, genetic code (preparation for Quiz #2 on 2/21).

Positional Annotation

2/7 T  Lecture: Mycobacteriophage gene calling (CDS)
Lab: Walk-through of workflow pipeline: Glimmer/GeneMark/tRNAscan/SDFinder Section 2; Parts B&C.
Reading: Binder, Section II-Gene Prediction, Part A & B

2/9 Th  Lecture: Thinking about genes: genetic code (KH).
Lab: Continue walk-through Section II Parts B & C. Answer questions page 74 & 97 (entries into lab notebook)

2/14 T  Lecture: Gene finding in Mycobacteriaphage (CDS)
Lab: Etude training, work through genes 1 to 3 (CDS).

2/16 Th  Lab: Complete Etude training, genes 7, 10, 11, 12 (CDS)
Reading: Pham…Hatfull Microbiology 153: 2711-23

2/21 T  Quiz #2
Lecture: Phage life-styles, lytic vs lysogenic, and required gene functions (DB)
Lab: Apollo walkthrough (Ed Lee tutorial) (CDS)

2/23 Th  Lab: Receive draft sequence of phage for annotation (responsible for 20-30% of genes); begin analysis

2/28 T  Reading Discussion: Pham…Hatfull paper (RR due) (KH & CDS)
Lab: Annotation of your phage cont. (CDS)

3/1 Th  Lab: Annotation of your phage, individual positional annotations due
(upload final game_xml by end of day 3/2) (CDS)

3/6 T  Lab: Group presentations on preliminary gene calls, focusing on problematic calls

3/8 Th  Lecture: Comparative phage genomics (DB)
Lab: reconciliation of gene models; (upload group final game_xml by Friday 3/9)
Report (individual): challenges you faced, resolved and/or tagged in determining gene positions.

3/13 T  Spring Break

3/15 Th  Spring Break

Functional Annotation

3/20 T  Lecture: Overview of functional annotation and Phamerator (CDS)
Reading: Lab Binder, Discover Part A FYI #5 Gene Products and Functional Annotation guide.
Lab: Meet with TA to discuss final positional gene calls OR Lab Binder, Discover Part C – The Phamerator
Reading: Pope, et. al. (Cluster K phage).

3/22 Th  Guest lecture: Roger Beachy. Protecting plants from viruses.
Lab: functional annotation including Phamerator results

3/27 T  Reading Discussion: Pope et al discussion. RR due (KH & SCRE)
Lab: Functional annotation (CDS)

3/29 Th  Discussion: Group report on annotations (ppt & written); confirm cluster assignment.  
Lab: Continue functional annotation

4/3 T  Lecture: Multiple Sequence alignment (CDS)  
Lab: Clustal analysis: walkthrough (from Bio 4342) (CDS) & Clustal analysis of 2-3 of your genes (CDS)  
Reading: Faruque et al 2005 (RR)

4/5 Th  Lecture: Uses of phage (DB)  
Lab: In depth research into 2-3 gene products,

4/10 T  Discussion: Faruque et al 2005 (RR due) (SCRE & KH)  
Lab: In depth research cont.  
Discussion: Ethics in Research (KH)  
Reading: Binder, Share Part A - Ethics in Research (read before coming to class)

4/12 Th  Lecture: How to give a talk, how to do a poster (SCRE + guest Bill Whitaker)  
Lab: Cont. analysis, preparation of reports

4/17 T  Lab: Cont. functional annotation, preparation of reports, poster  
Lecture: Guest David Wang: Viral discovery

4/19 Th  Lab: Cont. analysis, preparation of posters and reports

4/24 T  Final Presentations (group ppt)

4/26 Th  Final Preparation for poster presentation

4/28  Poster presentations at the WU Undergraduate Research Symposium  
Attendance Required!

4/30  Final papers due! (individual)
Readings (required, reading reflections due):


Reference:


III. Course Grading

The most important part of doing well in this course is attending all scheduled and any additional necessary class meetings, and having a good attitude while performing your analysis and participating in course discussions. This phase of our phage analysis is computer-based. Some of you will have more computer experience than others; if you can help your lab partners with computer issues, please do so! As before, this analytical work requires that you to be attentive to detail, careful in the execution of your work, thoughtful in discussion - and reasonably cheerful while doing the repetitive work necessary for success! Our goal is publication-ready analysis of our phage genomes. Your grade will be determined as follows:

25% course participation and attitude
15% quality of lab notebook (submitted to the instructor on request)
5% presentation on physical annotation March 6 and on functional annotation March 29 (oral PPT team report)
5% written report on physical annotation (written individually, due March 8)
15% written report on the project as a whole (written individually, re-write of fall portion due Feb 2, final paper due May 3)
10% final presentation (oral PPT to class April 24, poster presentation at WU Undergraduate Research Symposium April 28)
15% five reading responses
10% two quizzes

Attendance is expected. If you are ill, please send an email to Drs. Elgin and Shaffer and let them know your circumstances prior to the class meeting. Be sure to communicate with us if a problem arises that prevents you from attending class. This should happen only in a genuine emergency - plan ahead!

IV. Cell Phone Usage

Cell phone usage in class/lab is distracting to instructors and fellow students. While in class/lab you should keep your phone stowed in your backpack, and not use it at all (not as a phone, timer, camera or calculator).

V. Academic Integrity

By its nature, science is a collaborative endeavor. You will be assigned to a group of lab partners, and you and your partners, other class members and instructors will need and want to discuss experimental protocols and results. You should assume however, that any assignments in this course are meant to be your independent work, unless the instructor explicitly tells you otherwise. Lab groups will give the final presentation as a team, and all members are expected to participate equally. Please make sure you are familiar with the Washington University Undergraduate Student Academic Integrity Policy.