

Bio 192 Schedule, Spring 2009

Class meets in 013 Eads Hall, 1:10 – 4 pm Tuesday, 1:10 – 3 pm Thursday

Finishing

- 1/13 T Lecture: Review of last semester's accomplishments, goals for the coming semester (KH).
Lecture: Structure of DNA; DNA replication (SCRE).
Lab: Watch video (Whole Genome Shotgun Sequencing: HHMI/SEA).
Reading: Binder Part 2, Analyze, Sec. 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 Sanger sequencing (SCRE).
- 1/15 Th Lecture: PCR, Sanger sequencing (SCRE).
Lab: DNA assembly activity (SCRE). Enter results/conclusions in lab notebook.
Reading: K Mullis, (1990) Sci American 262: 56-65 (RR)
- 1/20 T Discussion: Mullis paper. RR due.
Lecture: Sample receipt and process flow at JGI (Goodwin PPT) (SCRE).
Lab: Introduction to Sequencer using ExampleGenome (Binder: Finishing, Part B)
(AT). Examine different options for setting parameters. Answer questions on pp.11 and permits. 15 of Sec. I B in lab notebook. Continue with Sec. I C as time permits.
Reading: Binder, Finishing, Part B.
- 1/22 Th Lecture: Viral genome draft sequence/finishing at LANL-JGI and WU (Chertkov ppt; LB slides) (SCRE).
Lab: Using Primer3 software, select primers to cover the gap in contig 10 (Analyze fig. 18). Report the sequence coordinates of your choice, and defend (report characteristics – see C 2). Repeat for other low quality regions of Contig 10. Enter your results into your lab notebook. (AT)
Reading: Binder, Finishing, Part C. Also look at ABI sequencing tutorials (<http://web.mit.edu/7.02/resources/Blast-tutorial/readseq.shtml>).
- 1/27 T Quiz #1
Lecture: Introducing your phage; issues in finishing ends (D S-J ppt; KH)
Lab: Finishing the sequence of your phage: what is required and candidate primers
(AT)
- 1/29 Th Lecture: Thinking about genes: transcription (SCRE)
Lab: Continue finishing the sequence of your phage. (AT)
Reading: FHC Crick (1966) Sci American 215: 55-62.
Assignment: Problem set #2 on transcription, genetic code

Note: we are planning to use the primers designed to complete the sequence of our phage. As needed, we will interrupt the schedule below to call additional primers for this task.

Annotation

- 2/3 T Lab: Finish calling primers to complete sequence of your phages.
Lecture: Mycobacteriophage gene calling (L Barker, D Jacobs-Sera, SCRE)

- Lab: Walk-through of workflow pipeline: introduction to GBrowse, Apollo. How many genes are identified by Glimmer, by GeneMark, and by tRNAscan for Phyler? (AT)
- Reading: Binder, Gene Prediction, Part A
Reading: S Eddy (2004) Nature Biotech. 22: 1315-16. What is a hidden Markov model?
- 2/5 Th Lecture: Thinking about genes: genetic code (SCRE).
Lab: Continue walk-through as needed. Answer questions, page B24 (entries into lab notebook)
Reading: Binder, Gene Prediction, Part B
- 2/10 T Lab: A re-introduction to NCBI BLAST, other bioinformatics sources/tools (KH).
Answer questions on BLAST, p C22 (AT).
Reading: Binder, Gene Prediction, Part C
- 2/12 Th Discussion: Crick paper, RR due.
Lab: Apollo walkthrough with Phyler dataset (Ed Lee tutorial) (AT)
Reading for 2/17: Hatfull paper, TBA (RR)
- 2/17 T **Quiz #2**
Lecture: Phage life-styles, lytic vs lysogenic, and required gene functions (DB)
Lab: receive own phage for annotation (responsible for 1/3 genes) (AT)
- 2/19 Th Discussion: Hatfull paper TBA (RR due) (DB)
Lab: Annotation of your phage (AT)
Reading for 2/24: TBA
- 2/24 T Lecture: Comparative phage genomics (DB)
Lab: Annotation of your phage (AT)
Reading: TBA
- 2/26 Th Discussion: reading from 2/24 (RR due) (DB)
Lab: Annotation of your phage (AT)
- 3/3 T Lecture, Sidney Brenner: Genomes and Evolution (iBio, ASCB)
Lab: Annotation of your phage, begin reconciliation with partner on gene models (AT)
- 3/5 Th Lab: As needed, reconciliation of gene models (AT)
- 3/10 and 3/12 – Spring Break
- 3/17 T Lecture: Protein structure and function (include noodle folding; aa properties, aa code) (SCRE)
Reading/Lab: Binder, Discover Part A (answer question in lab notebook) (AT)
- 3/19 Th Lecture: Gene ontologies and why we use them (E Lee ppt) (SCRE)
Lab: preparation of report on gene models.
- 3/23 Mon 4 pm: Seminar by Sidney Brenner.
- 3/24 T Oral and written reports: documentation of gene models (with partner). Final genomes will be submitted for Phamerator analysis.

- 3/26 Th Reading/Lab: Binder, Discover Part B (answer questions in lab notebook). (AT)
Reading for 3/31: Hatfull et al 2008
- 3/31 T Lecture: Phamerator analysis, Clustal analysis (S Cresawn PPT) (SCRE)
Lab: Clustal analysis: walkthrough (from Bio 4342) (CS)
- 4/2 Th Discussion: Hatfull et al 2008 (RR) (SCRE)
Lab: Clustal analysis of some of your genes; functional annotation (AT)
- 4/7 T Lecture: Uses of phage (DB)
Reading/Lab: Binder, Discover Part C (answer questions in lab notebook) (AT)
Reading for 4/9: Faruque et al 2005 (RR)
- 4/9 Th Discussion of Faruque et al 2005 (RR) (DB)
Lab: Functional annotation
- 4/14 T Lecture: Roger Beachy: Plant Viruses and Crops (iBio, ASCB)
Lab: Using Phamerator analysis; assignment of phage to subgroup
- 4/16 Th Discussion with R Beachy, Director, Danforth Plant Science Center (pending)
Lecture: How to give a talk, how to do a poster (SE)
Lab: Cont. functional annotation, preparation of reports
Reading for 4/21: Binder, Share Part A (Ethics in Research)
- 4/21 T Discussion: Ethics in Research
Lab: Cont. functional annotation, preparation of reports
Reading: Binder, Share Part B (Mechanisms of Dissemination)
- 4/23 Th Lecture/discussion: Dissemination of genomics information
Lab: Cont. functional annotation, preparation of reports; print poster
- 4/25 Sat Poster presentation at the WU Undergraduate Research Symposium
- 4/28 T Oral presentations on your phage; final papers due.

Readings:

Mullis, Kary B (April 1990) The Unusual Origin of the Polymerase Chain Reaction. *Scientific American* 262: 56-65 (RR)

Crick, FHC (1966) The Genetic Code: III. *Scientific American* 215: 55-62 (RR)

Eddy, Sean R (2004) What is a hidden Markov model? *Nature Biotech* 22: 1315-16.

Webber, C and Ponting, C P (2004) Genes and homology. *Curr Biol* 14: R332-3.

Hatfull, GF et al, TBA (RR)

Pedula, M et al (2003) Origins of highly mosaic mycobacteriophage genomes. *Cell* 113: 171-182 (tentative).

Hatfull, GF, SG Cresawn, RW Hendrix (2008) Comparative genomics of the mycobacteriophages: insights into bacteriophage evolution. *Res. Microbiol.* 159: 332-339. (RR)

Faruque, SM, MJ Islam, QS Ahmad, ASG Faruque, DA Sack, GB Nair, JJ Mekalanos (2005) Self-limiting nature of seasonal cholera epidemics: Role of host-mediated amplification of phage. *Proc Natl Acad Sci USA* 102: 6119-6124.

Revised 1/29/09 SCRE