Bio 192 Phage Bioinformatics: Schedule, Spring 2015

Finishing

1/13 T **Discussion:** Review of last semester's accomplishments (KH); course information, goals for the coming semester, writing a scientific paper (SCRE).
Lecture: Review structure of DNA (models); DNA replication; intro to PCR (SCRE).
Reading: Reading 1 from binder: Analyze, Section I - Finishing, Part A. Be sure to look at the web sites that show animations of DNA replication and of PCR.
Assignment: Problem set #1 on DNA replication, PCR and Sanger sequencing (preparation for Quiz #1 on 1/27).

1/15 Th **Lecture:** Next-Gen sequencing; sequencing results Preliminary Report (CDS).
Discussion: Organization into groups for assembly and primary assessment of data.
Lab: DNA assembly activity (enter results/conclusions in lab notebook) (SCRE)
Demo: Intro to the PC and virtual machine, data in/out. If smrtportal available, intro to web site, how to connect, how to start process, schedule analysis if needed.
Reading: K Mullis, (1990) Sci American 262: 56-65 (RR due next class)

1/20 T **Reading Discussion**: Mullis paper. RR due. (SCRE, KH, CDS discussions)
Demo: Quality assessment of assemblies (CDS)
Lab: Quality Analysis of assembly by BLAST, end structure, coverage (CDS)

1/22 Th **Lecture:** Thinking about genes: transcription (TA or SCRE)
Lab: Assembly analysis of individual phages (cont.) (CDS)
Assignment: Assembly analysis summary due by end of class

Positional Annotation

1/27 T **Quiz #1 [**20 min] (KH)
Discussion: Reorganization of groups (if needed) dropping low quality genomes
Lecture: Thinking about genes: genetic code (SCRE).
Lab Intro: Genome Analysis: Annotation Pipelines (CDS)
Lab: The phage annotation pipeline I: Gbrowse, BLAST & DNA Master

1/29 Th **Lab Intro:** The annotation pipeline II: Annotation Guidelines (CDS)
Lab: Etude training, work through 1st few genes (CDS).
Reading: FHC Crick (1966) Sci American 215: 55-62.
Assignment: Problem set #2 on transcription, genetic code (prep for Quiz #2 on 2/19).

2/3 T **Lab Intro:** Gene Annotation: data collection and analysis (CDS)
Reading: Evaluating Genes.
Lab: Complete Etude training (if necessary); start positional annotation (CDS).

2/5 Th **Reading Discussion:** Crick (1966) Sci Amer 215: 55-62 (RR due) (SCRE, KH, CDS)
Lab: Data collection and management (CDS), Continue positional annotation

2/10 T **Lecture:** Phage life-styles and required gene functions (TA)
Lab: Construction of proper "Notes" (CDS). Continue positional annotation

2/12 Th **Lab:** Finalize positional annotation; start group reconciliation (CDS)
Reading: Pham…Hatfull Microbiology 153: 2711-23

2/17 T **Lab meeting**: preliminary gene calls, focusing on problematic calls (PPT).
Lab: Group reconciliation of positional calls (CDS)
Discussion: Preparation of group presentations.

2/19 Th **Quiz #2** [20 min] (KH)
Lab: Group finalizes gene calls; final validated GFF file due by end of class.
Report (individual)**:** preliminary written report, challenges faced & resolved (due 2/24).

Functional Annotation

2/24 T **Reading:** Reading Discover_Feb25.pdf, Part A Gene Products and Annot_guide_ch10_Feb25, Assigning gene function
Lab Intro: DNA Master, Phamerator & functional annotation (CDS)
Lab: Functional annotation in DNA Master (CDS)

2/26 Th **Reading Discussion:** Pham…Hatfull paper (RR due) (SCRE, KH, CDS)
Lab: Functional annotation in DNA Master (CDS)

3/3 T **Guest Lecture:** Nathan Kopp: Tissue Specific Expression Analysis – Robust Enrichment of Risk-gene Transcripts in Disease-relevant Tissues.
Lecture: Ideas for in-depth investigations [15'] (SCRE)
Lab: Functional annotation in DNA Master (CDS)

3/5 Th **Lab:** Functional annotations, preliminary DNA Master file due by end of class for incorporation into Phamerator

3/10 T **Spring Break**

3/12 Th **Spring Break**

In Depth Investigations

3/17 T **Guest Lecture:** Jeff Gordon: A Microbial View of Human Postnatal Development
Lab Intro: Multiple sequence alignments (CDS or TA)
Lab: Clustal walkthrough and analysis of phage genes
Consultation: propose detailed investigations (SCRE)

3/19 Th **Lab:** In depth detailed investigations, update annotations if indicated.
Presentation: Use of Clustal (Nathan Kopp)
Assignment: propose detailed investigation (~1-2 pages, due by 3/31 to SCRE)

3/24 T **Reading Reflection**: Cresawn et al 2015, Comparative Genomics of Cluster O Mycobacteriophages.
Lab: In depth investigations and final annotations

3/26 Th **Guest Lecture:** Molly Gibson: Ecology of Antibiotic Resistance in Microbial Communities
Lab: Continue individualized investigations, update annotations as necessary.
Abstract for Undergraduate Research Symposium due at beginning of class; feedback given by the end of class, must be submitted 3/27.

3/31 T **Lab meeting:** Presentation by group including discussion of individualized investigations, PPT (individual note due now at the latest).

Reading assigned: Share_Apr10.pdf (Part A only) - Ethics in Research; and WU case study (for discussion 4/7)

4/2 Th **Lecture:** How to structure a poster or short talk about your work (SCRE)
Lab: Continue individualized investigations

4/7 T **Discussion**: Ethics in Research (TA, SCRE, KH, CSD)
Lecture: Uses of phage (KH)
Lab: Group Poster work
Reading: Faruque et al 2005 (RR)

4/9 Th **Guest lecture:** David Wang: Emerging Viruses
Lab meeting: preparation of posters and reports

4/14 T Small group/individual consultations on posters and reports.
Lab: Finish group poster. Final copy of poster due by end of class!

4/16 Th **Presentation / Discussion:** How to give a poster (SCRE & Bill Whitaker-OK)

4/17 F **Poster presentations at the WU Undergraduate Research Symposium Attendance Required!**

4/21 T **Discussion**: Faruque et al 2005 (RR due) (SCRE, KH, CDS)
Reading: Share_Apr10.pdf (Part B only) – Mechanisms for Dissemination
Lab: Finalize DNA Master file, confirm proper notes in file.

4/23 Th **Discussion:** Mechanisms for dissemination (SCRE, KH, CDS)
Lab: Final Data submission and validation; work on final written reports as time allows
Final papers due at end of class! (individual)

Papers for Reading Responses:

1. Mullis, Kary B (April 1990) The unusual origin of the Polymerase Chain Reaction. Scientific American 262: 56-65.

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

3. Pham TT, Jacobs-Sera D, Pedulla ML, Hendrix RW, Hatfull GF. (2007) Comparative genomic analysis of mycobacteriophage Tweety: evolutionary insights and construction of compatible site-specific integration vectors for mycobacteria. Microbiology 153: 2711-23.

4. Pope, et al., (2011) Cluster K mycobacteriophages: insights into the evolutionary origins of mycobacteriophage TM4. PLoS One 6: e26750.

See also Etienne L and Emerman M (2013) The mongoose, the pheasant, the pox, and the retrovirus. PLoS Biology 11: e1001641.

5. 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.

See also Reardon, S (2014) Phage therapy gets revitalized. Nature 510: 15-16.

References:

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

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

Hatfull, GF, ….RW Hendrix (2006) Exploring the mycobacteriophage metaproteome: phage genomics as an educational platform. PLoS 2: e92.

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

Hatfull, GF (2010) Mucobacteriophages: Genes and genomes. Ann Rev Microbiol 64: 331-56.

Pope, et. al., (2011) Expanding the diversity of mycobacteriophages: Insights into genome architecture and evolution. Plos One 6: e16329.

Jacobs-Sera, D, et al. (2012) On the nature of mycobacteriophage diversity and host preference. Virology 434: 187-201.

Stern AM, A Casadevall, RG Steen, FC Fang (2014) Financial costs and personal consequences of research misconduct resulting in retracted publications. eLife 3:e02956. DOI: 10.7554/eLife.02956

Hu JC (2014) Why do scientists commit fraud? http://www.slate.com/articles/health_and_science/science/2014/08/fraud_in_stem_cell_research_japanese_biologist_yoshiki_sasai_commits_suicide.html

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