BIMM170 Genomics Research Initiative Lab II

Tues/Thurs 1pm - 4pm, Tata Hall room 2301
Instructor: Rachel Dutton (rjdutton@ucsd.edu); IA: Jennifer Doan (jedoan@ucsd.edu)
Office hours: By request

This course is part of the Howard Hughes Medical Institute (HHMI) SEA-PHAGES program. SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science, https://seaphages.org/) is a discovery-based undergraduate research course that begins with simple digging in the soil to find new viruses, but progresses through a variety of microbiology techniques and eventually to complex genome annotation and bioinformatic analyses.

When last seen, your phage DNA was in a microfuge tube, and was then mailed off for sequencing. A file with a string of letters has returned to your computer screen. Now what?

A significant portion of the course this quarter is to analyze that string of letters (the sequence of your phage genome) and use a combination of comparative tools and bioinformatic algorithms to determine, to the best of your ability, the location and function of genes and features in the genome. The genome sequence and its hand-curated annotation will then be added to a global scientific database, becoming the basis of future experiments and endeavors. Along the way, you will learn about the field of Bioinformatics, and the power and limitations of performing experiments within the computer environment.

Learning objectives for the quarter:

- What is bioinformatics and why is it important?
- Practical understanding and familiarity with DNA sequence analysis
- What are genes and how do they work?
- Increased familiarity with molecular biology theory, lab practices and protocols

Important dates:

- **June 5:** UCSD Research Showcase, 3-6pm, **ATTENDANCE IS REQUIRED**

Useful links:

- SEA-PHAGES Bioinformatics Guide https://seaphagesbioinformatics.helpdocsonline.com
- Video Tutorials http://seaphages.org/videochannels/1/
- Phamerator: https://phamerator.org/
- PhagesDB.org

Grading:

- Effort and conduct: 100pts
- Quizzes and in-class assignments: 100pts
- Notebook and annotation documentation: 200pts
- Poster preparation and presentation: 100pts

Activities this quarter:

- **Bioinformatics:** Annotation of the King2 and Beuffert phages isolated in the Fall Quarter; 16S analysis of cheese bacteria isolated in the Fall Quarter; Sequencing data analysis
- Wet lab: Cheese bacteria antibiotic production tests; DNA library preparation and sequencing

Week	Date	Activities	**Reading** (from the SEA-PHAGES Bioinformatics Guide unless otherwise noted)
1	April 2	Overview of Spring Quarter plan; Intro to genomes and bioinformatics lecture; **Part 1: Context**. Compare your genomes to others; PhagesDB	
	April 4	**Part 1: Context** (Cont.) Compare your genomes to others; BLAST and Phamerator	"Surveying your genome"
2	April 9	**Part 2: Preparation.** Run GeneMark, Aragorn, tRNAscan	"Gathering Data"
	April 11	**Part 3: Auto-annotation.** DNA master, draft gene annotation	"Documenting your Annotation" and "Automatically annotating your genome"
3	April 16	**Part 3 (cont):** Predicting gene functions; BLASTP, HHPred, and TMHMM	"Predicting phage gene functions"
	April 18	**Part 4: Inspection, Review, Revision.** Check gene predictions; gaps; start sites	"Refining your annotations"
4	April 23	**Part 5: Prepare for submission.**	"Finalizing and submitting annotations"
	April 25	Cheese bacteria 16S analysis; Prepare cheese bacteria for antibiotic spot testing	
5	April 30	Cheese bacteria 16S analysis; Antibiotic spot testing	
	May 2	Review spot tests	
6	May 7	Library preparation	
	May 9	DNA sequencing	
7	May 14	Initial NGS data analysis	
	May 16	Genome assembly	
8	May 21	Genome annotation	
	May 23	Genome annotation	
9	May 28	Poster prep	
	May 30	Poster prep	
10	June 4	Lab clean-out	
	June 5***	**Research Showcase poster presentations (3-6pm) ****This is a Wednesday!!!**	