BINF2111 – Introduction to Bioinformatics Computing

Course Introduction

Richard Allen White III, PhD
RAW Lab

Lecture 1 - Tuesday Aug 19th, 2025

Learning Objectives

- Introduction Dr. White III and his RAW lab research

- Go through the Syllabus on Canvas

- Calendar and Schedule

- Computer set-up

- Introduce github page

Introduction general

- Dr. Richard Allen White III &
- Lab instructor: Andra Buchan (TA)

Tell us a little about yourself?

- Name
- Major
- Why this course?
- Main career goal (currently)
- Favorite food

What is bioinformatics?

Bioinformatics is an interdisciplinary field which harnesses computer science, mathematics, physics, and biology that harnesses computation to understand biology.

Computational biology = Bioinformatics

Introduction - Term Experiment

- What are the key words when you think of bioinformatics?

- Pick three words you know or have heard of.

- Link
https://forms.gle/r54H5mFqZM8Dgps39

- Word cloud for next class

Introduction – How many?

- How many people do you know in the class?

- Select one option (0, 1, 2, 3, >3)

- Link
https://forms.gle/dy3dPvCqBKX9dZqN9

- Results next class

Introduction – What year?

- What year are you at UNCC?

- Select a single term

- Link
https://forms.gle/WZJhpib32Ggu4EWR8

- Results next class

What is your major department ?

- Which department is you major in?

- Select one option (e.g., Bioinfomatics/Genomics)

- Link
https://forms.gle/13HZbKKic2d2vV1D6

- Results next class

RAW LAB

Understanding the totality of the virome - from farm to gut

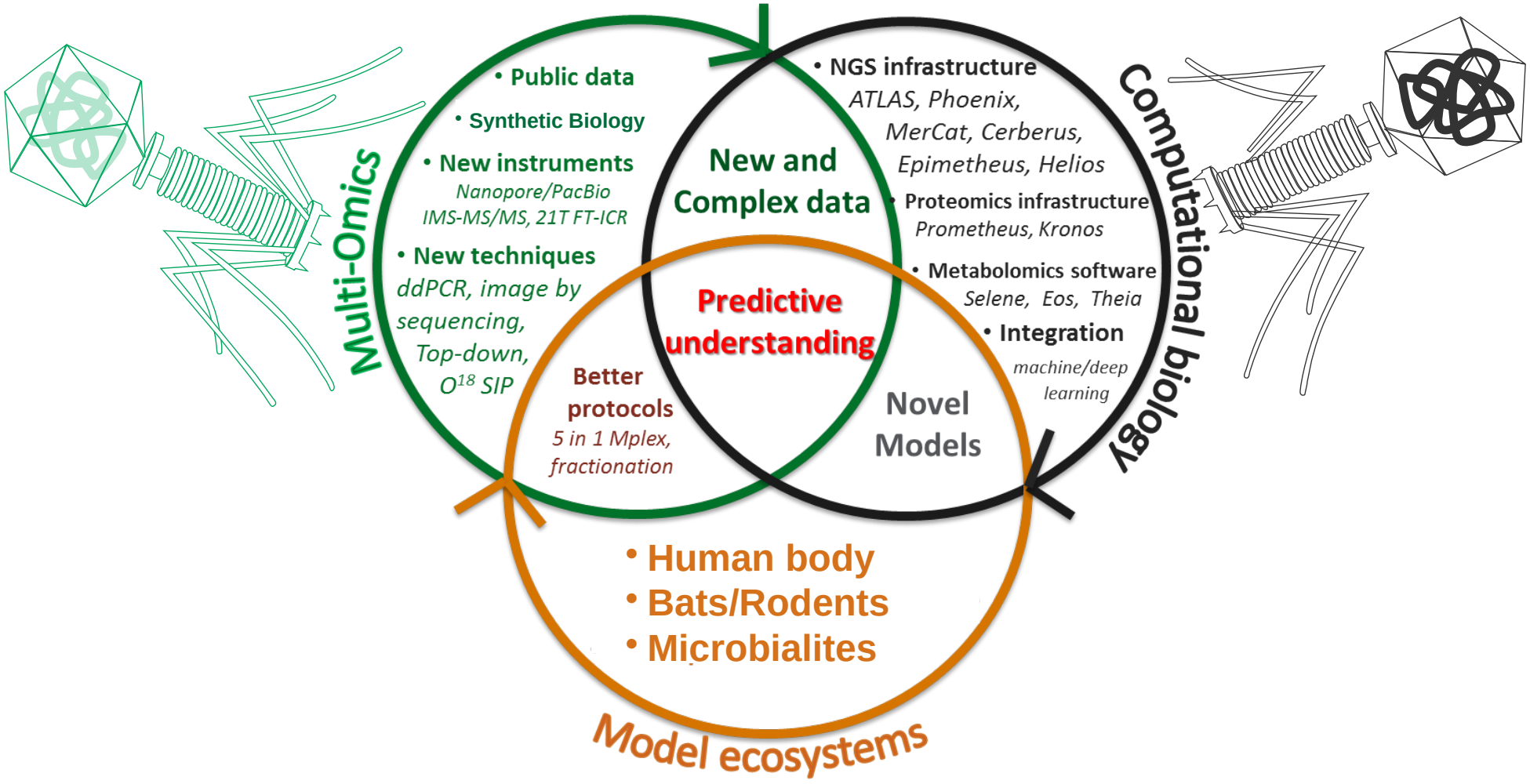
- Viral lifestyle influencing microbial-host interactions

- Phages as therapies for human viruses

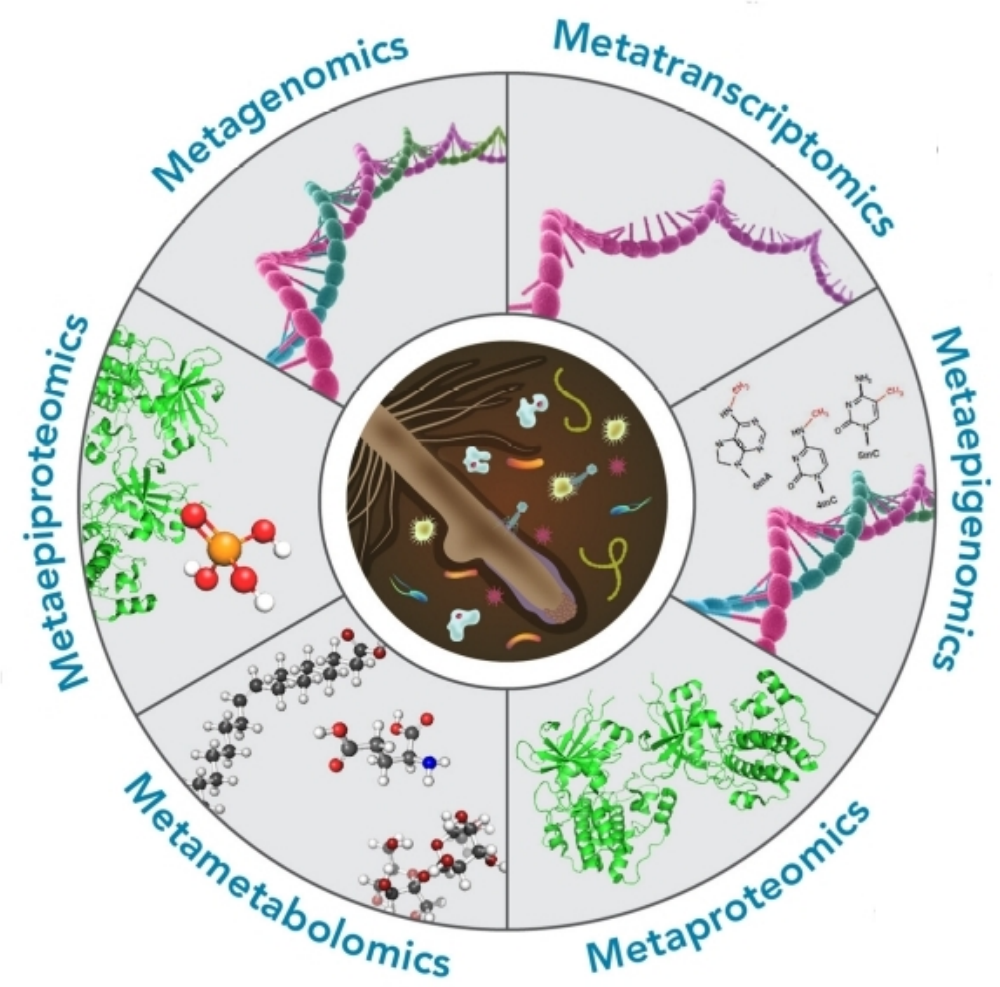
- Phage therapy for antibiotic resistant microbes

-> Check us at www.rawlab.org

RAW LAB - Group Model



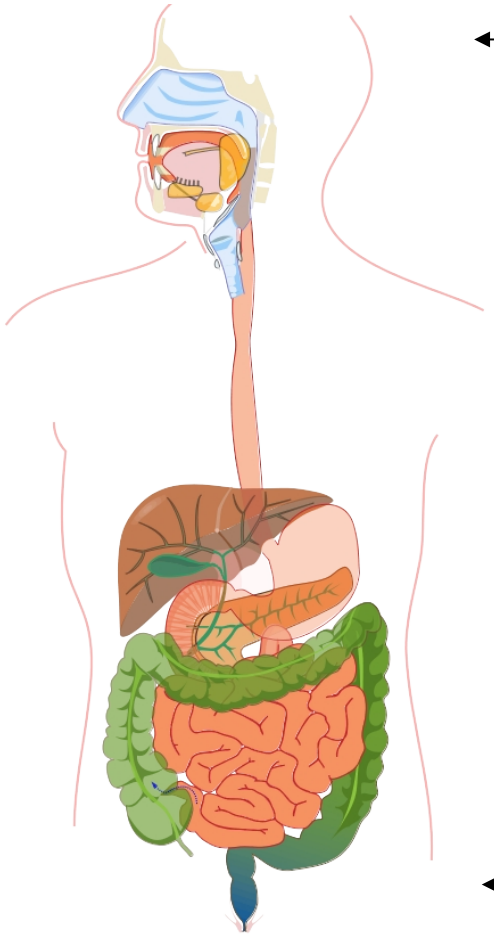
RAW LAB – Omics terms (Wheel O’ omics)



White III et al., 2017 Rhizosphere

Link to article:

RAW LAB - Human microbiome and virome



100 Trillion

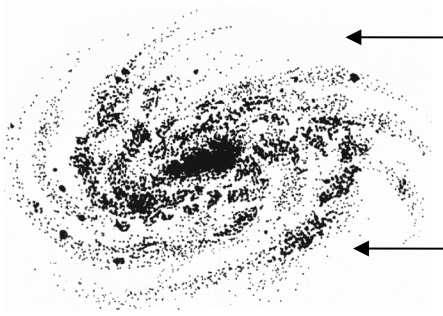
150:1 genes

5:1 viruses

1.3x cells

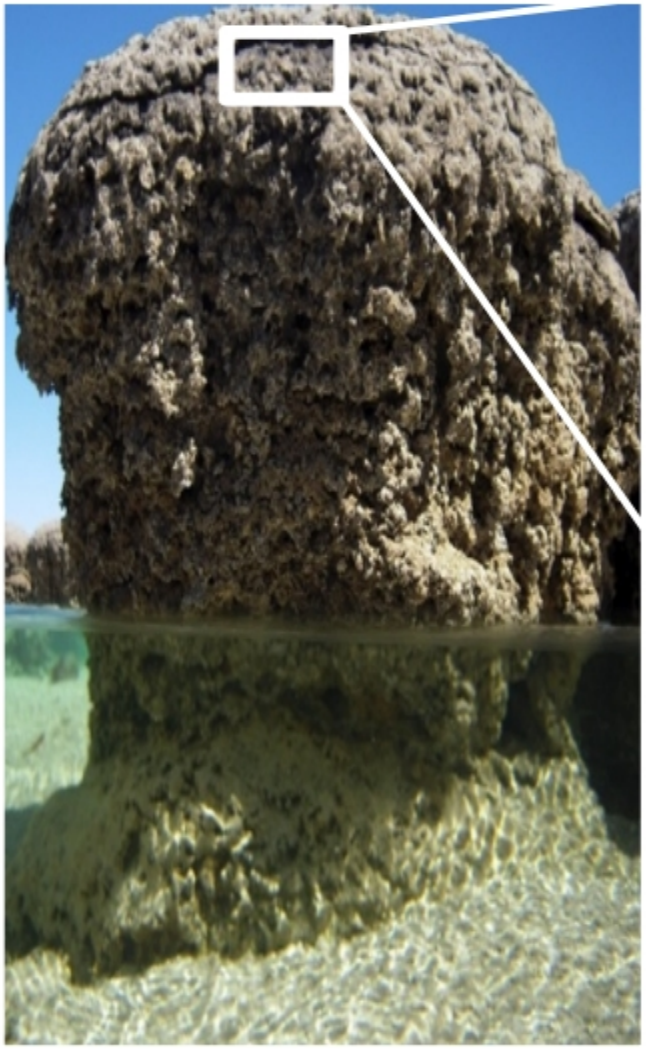
2.5x

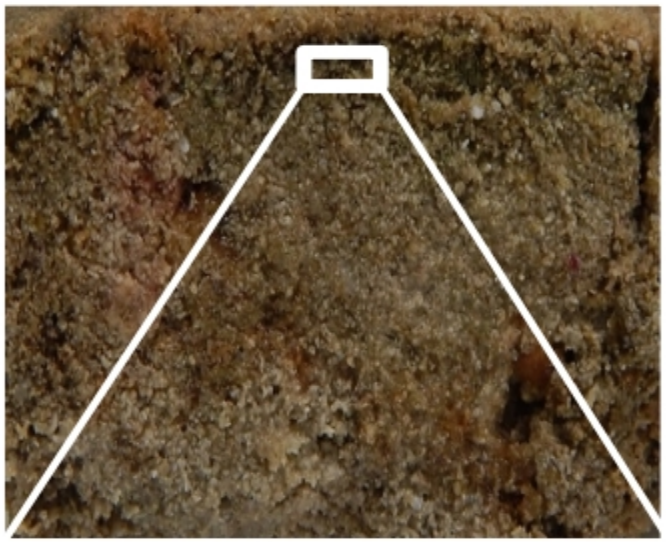
12.5x



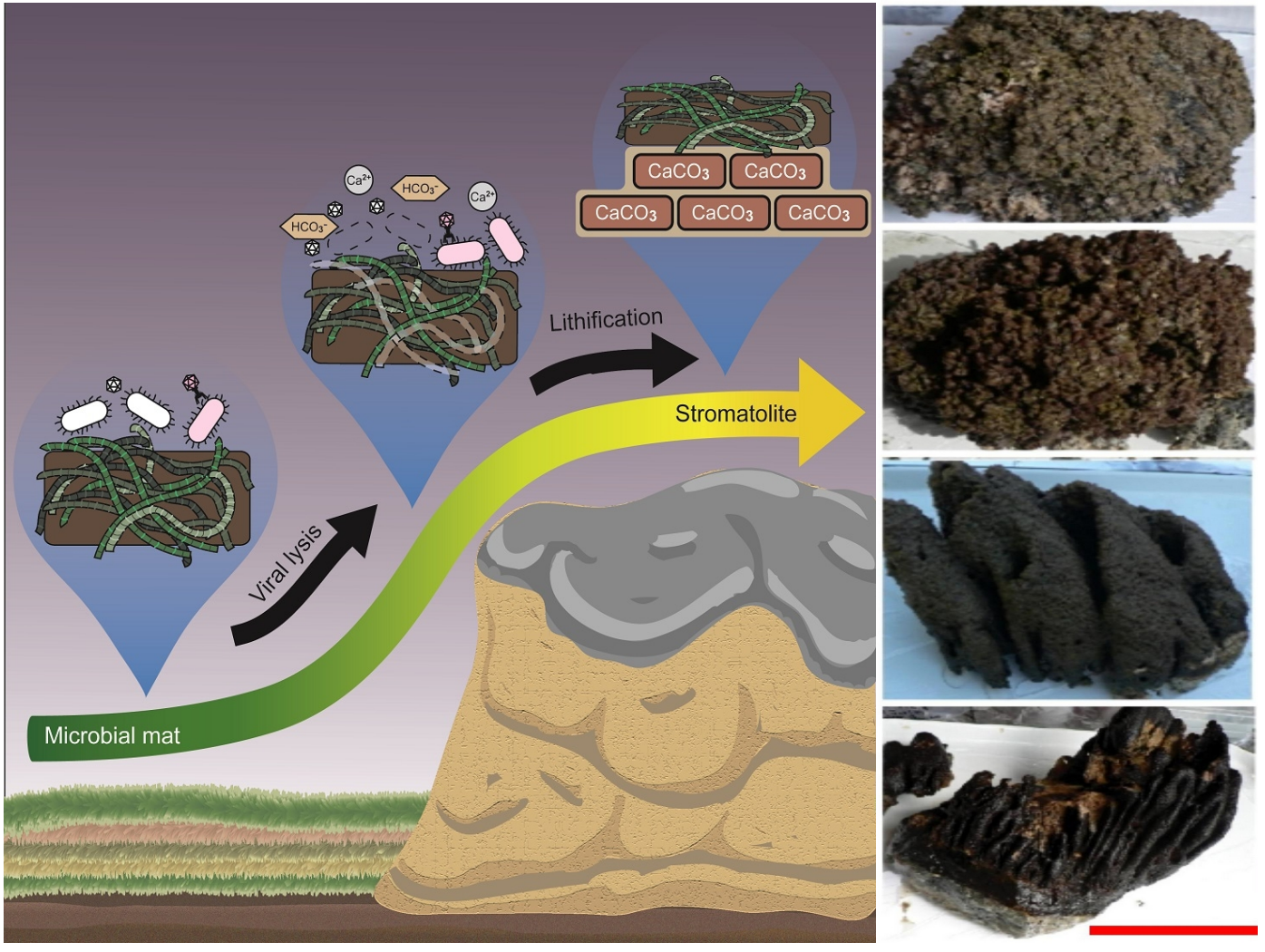
RAW LAB – Bats and rodents

RAW LAB - Modern microbialites/stromatolites

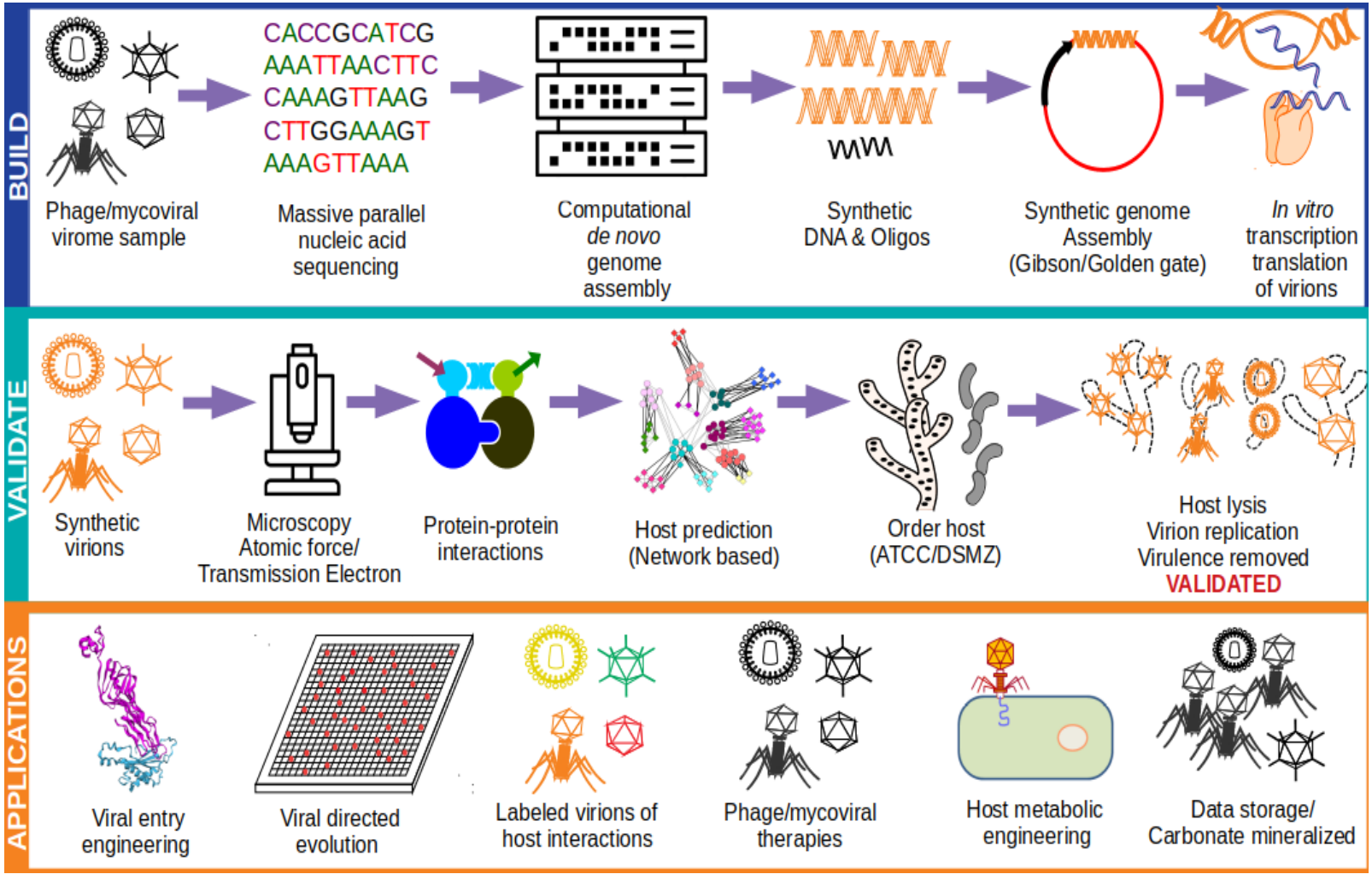




RAW LAB - Modern microbialites/stromatolites



RAW LAB – synthetic biology



Syllabus – essential course details

- Meeting time T/TH 11:30-12:45, TH lab 2:30-5:15 pm EST

- Office hours TH 5:15-6:15 pm or by appointment.

- Canvas

- No Slack

- Course github page (https://github.com/raw-lab/BINF2111)

- Bioinformatics building 217

Syllabus – essential course details II

- Computer required (Linux or MacOX preferred, Windows possible)

- Taken BINF1101/1101L (let me know if you haven’t)

- Textbooks: None required for this course

- Zero credit lab must be taken concurrently with the course

- One grade for both BINF 2111 and 2111L

Syllabus: Objectives of the course

- Use and understand UNIX command line environment

- Use built-in UNIX commands to manipulate files and data

- Text and file manipulation (sed, grep, bioawk, python)

- Basic knowledge and use of github

- Use bash shell scripts to drive pipelines of bioinformatics programs

- Use of supercomputer for running bash shell scripts (basic slurm)

- Use python scripts to read, manipulate and write bioinformatics datafiles

Syllabus: Grading

Grading rubric

- Lab assignments: 30% (12 Lab assignments, 2.5% each, late assignments will NOT be graded)

- Daily Quizzes: 40% (two lowest scores will be dropped)

- Mid-term Exam: 10% (5% lecture/lab)

- Final Exam: 10% (5% lecture/lab)

Based on points for grading

100-90% = A
89-80% = B
79-70% = C
69-60% = D
<59% = F or U

Any grade in-between will be rounded to the next highest grade.
While grades are important, and you should strive to get the highest marks.
The knowledge you take with you and gain will last a lifetime!!

Syllabus: Sections Diversity, Mental health, Title IX

- Please read: An environment of non-discrimination and diversity section

- Please read: Mental healthcare and positive self-care

- Please read: Title XI reporting of sexual harassment or other related reporting

- Please read: Disability accommodations

ANY Questions?

Generative AI (FM/LLM/NPL)

Using generative AI in the form of foundation models (FMs) and their subset of FMs called large language models (LLMs) is prohibited during quizzes and exams. They can be used in labs and training for quizzes and exams. This includes examples chatgpt, bard, DALL-E, Midjourney, DeepMind, or other.

ANY Questions?

Syllabus: Course Schedule

Week 1 (Aug 19th) Introduction to UNIX and command line
Week 2 (Aug 26th) UNIX commands (cut, grep, etc)
Week 3 (Sep 2nd) Sed/grep/bioawk file manipulation
Week 4 (Sep 9th) Regular expressions
Week 5 (Sep 16th) Bash shell scripting basic, Bash shell/slurm - SuperCPU operations Week 6 (Sep 23rd) Github introduction and markdown
Week 7 (Sep 30th) Mid-term Exam
Week 8 (Oct 7th) No Classes - Student Recess
Week 9 (Oct 14th) Basic Python Commands
Week 10 (Oct 21st) Python loops, lists, and basic file methods
Week 11 (Oct 28th) Python functions, dictionaries, regular expression
Week 12 (Nov 4th) Python - Pandas and Seaborn
Week 13 (Nov 11th) Rust Introduction
Week 14 (Nov 18th) Review of course
Week 15 (Nov 25th) No Classes – Thanksgiving
Week 16 (Dec 2nd) Final Exam or Review course

Github page

- https://github.com/raw-lab/BINF2111

Windows tutorial to install Linux

- On canvas

- On our github in course materials

https://github.com/raw-lab/BINF2111/blob/main/course-materials/Windows-Install-linux.pdf
https://github.com/raw-lab/BINF2111/blob/main/course-materials/Install_Brew-Sed_mac.pdf

Quiz 1

- On canvas now