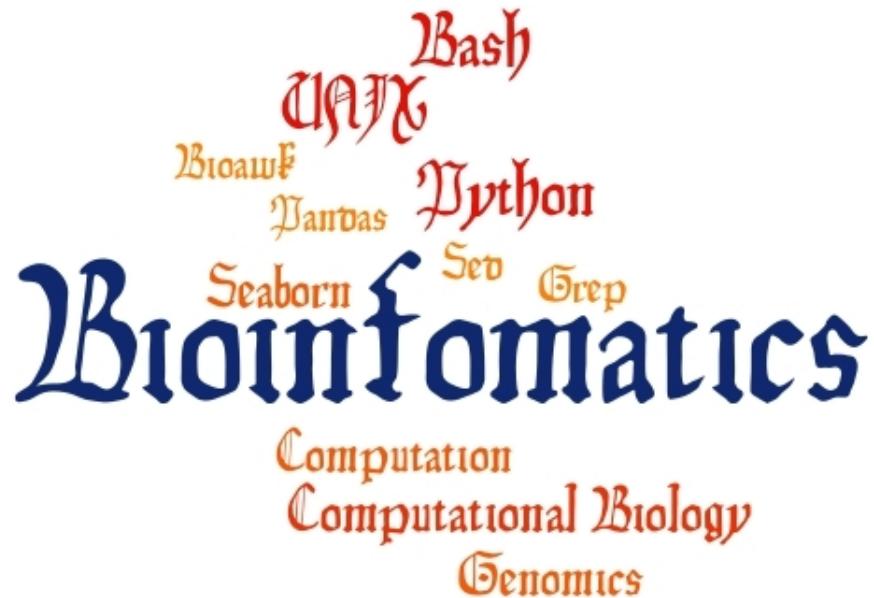


BINF2111 - Introduction to Bioinformatics

Computing

Course Introduction



Richard Allen White III, PhD

RAW Lab

Lecture 1 - Tuesday Aug 22nd, 2023

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 & Andra Buchan (TA)
- Lab instructor: Madeline Bellanger

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 ?

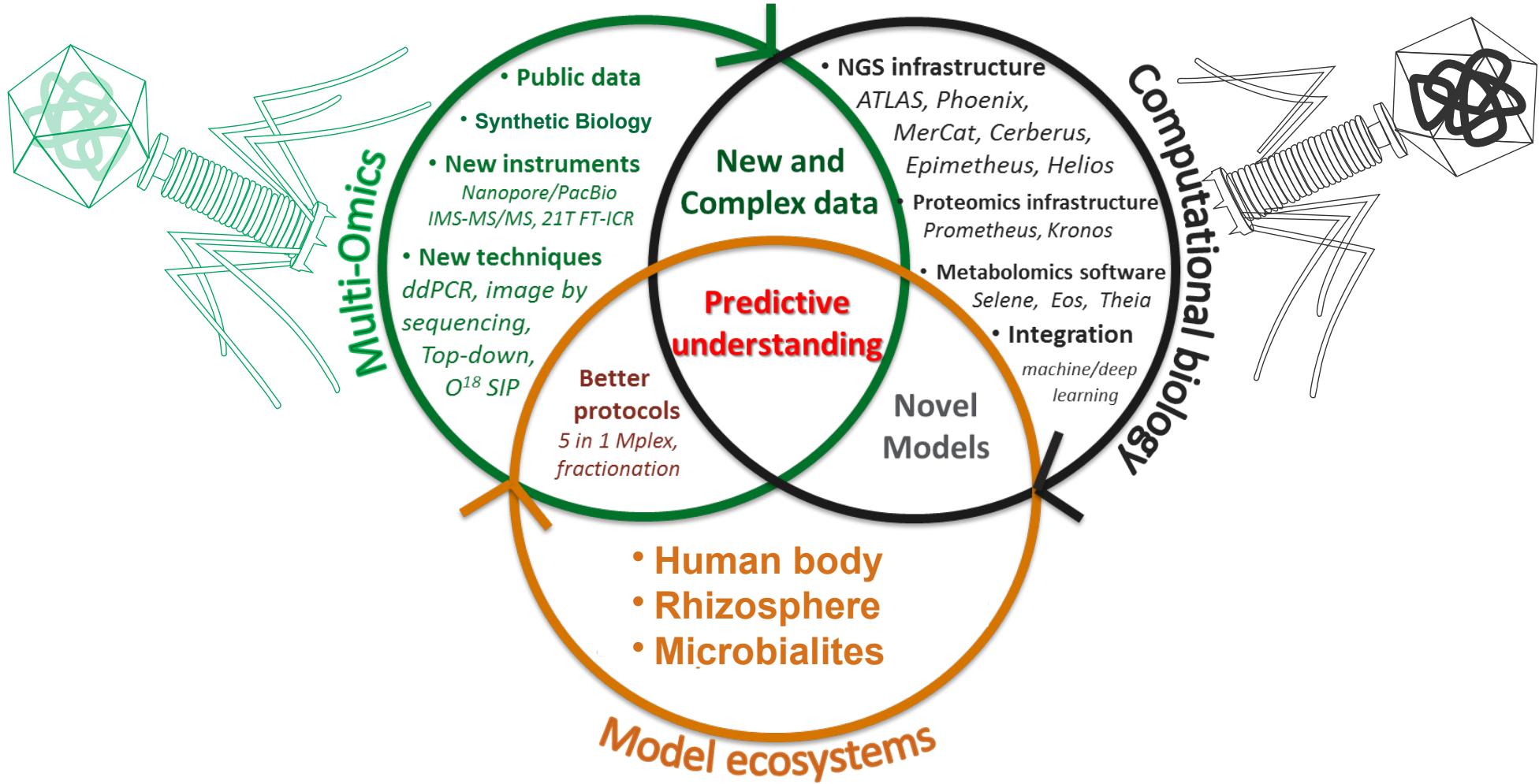
- Which department is you major in?
- Select one option (e.g., Bioinfomatics/Genomics)
- Link
<https://forms.gle/13HZbKKic2d2vV1D6>
- Results next class

RAW LAB

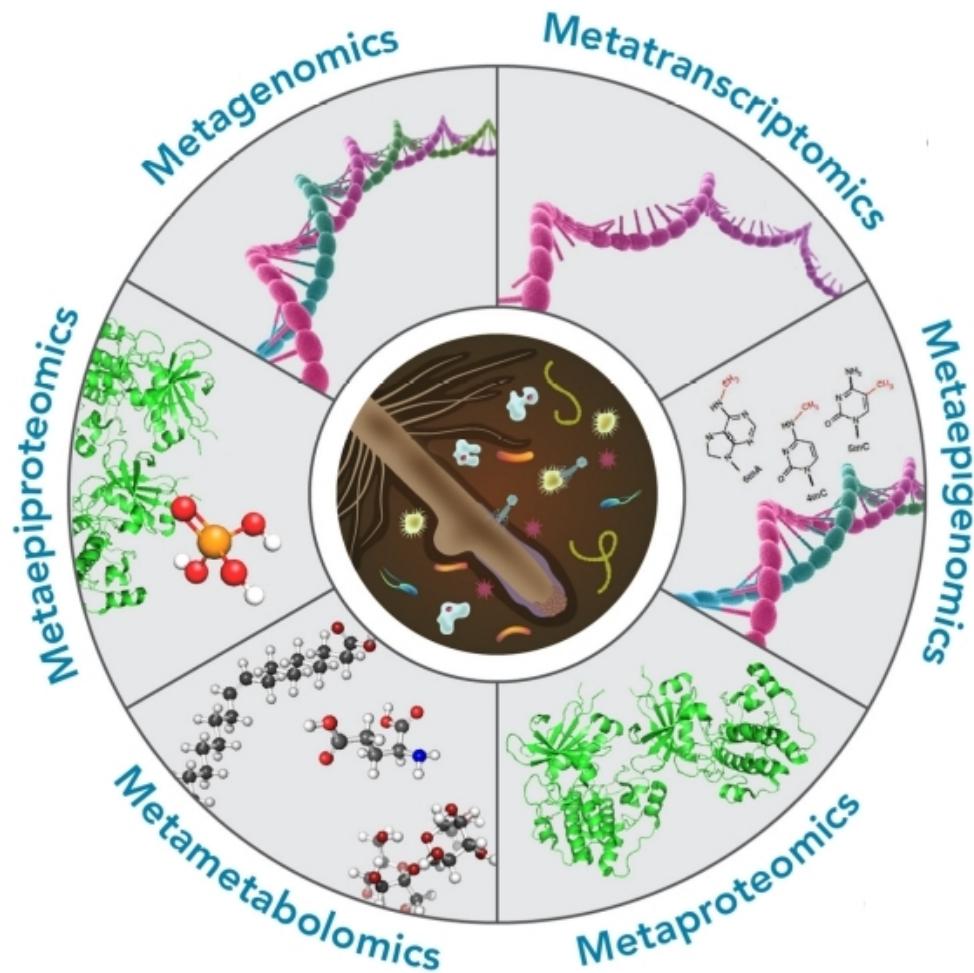
Understanding the totality of the virome - from farm to gut

- 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

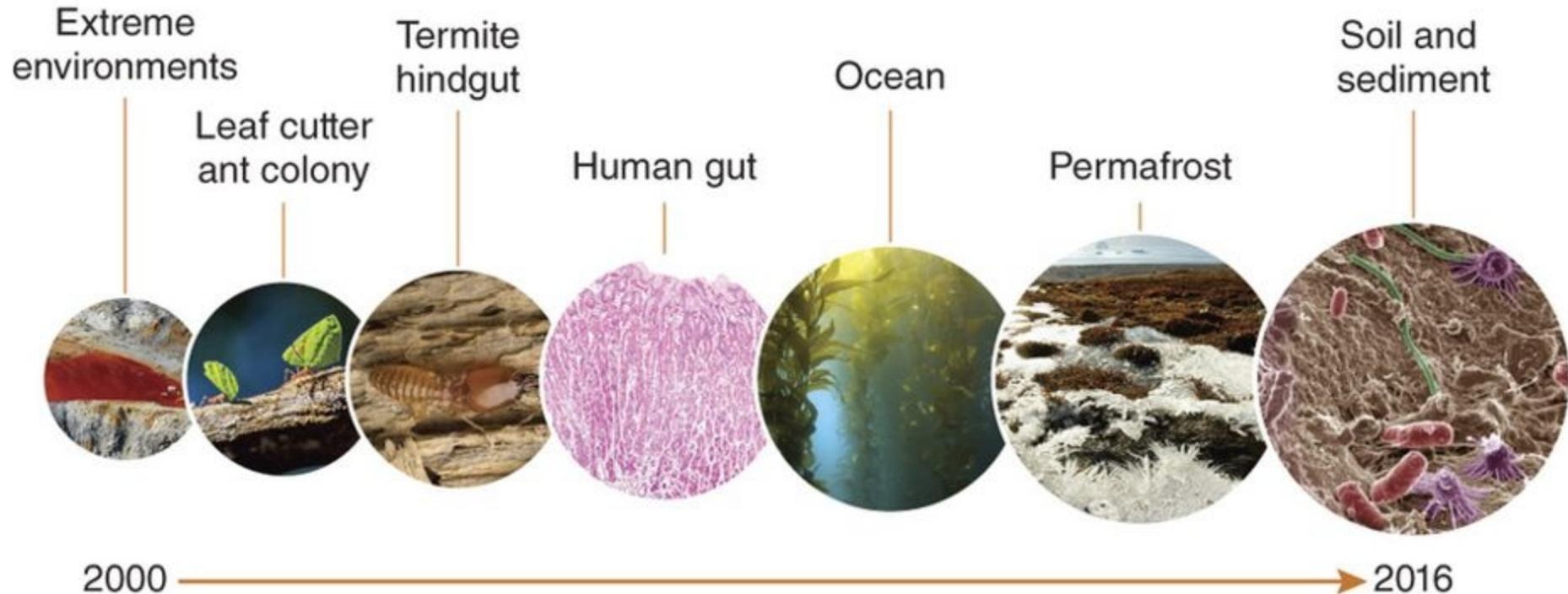


RAW LAB – Omics terms (Wheel O' omics)



RAW LAB - microbiomes

Microbiome complexity and multi-omics analysis timeline

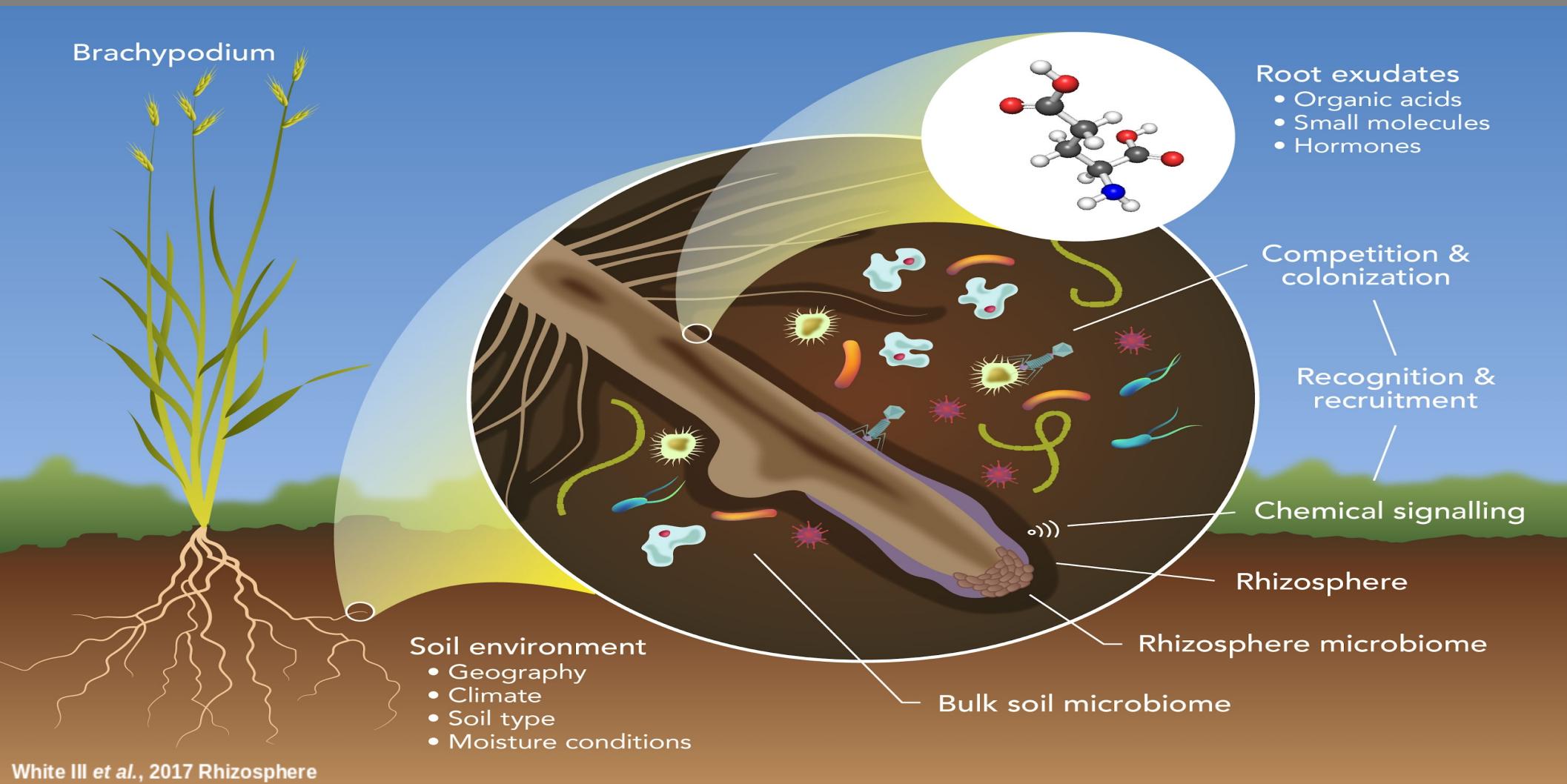


White III et al., 2016. Nature Protocols

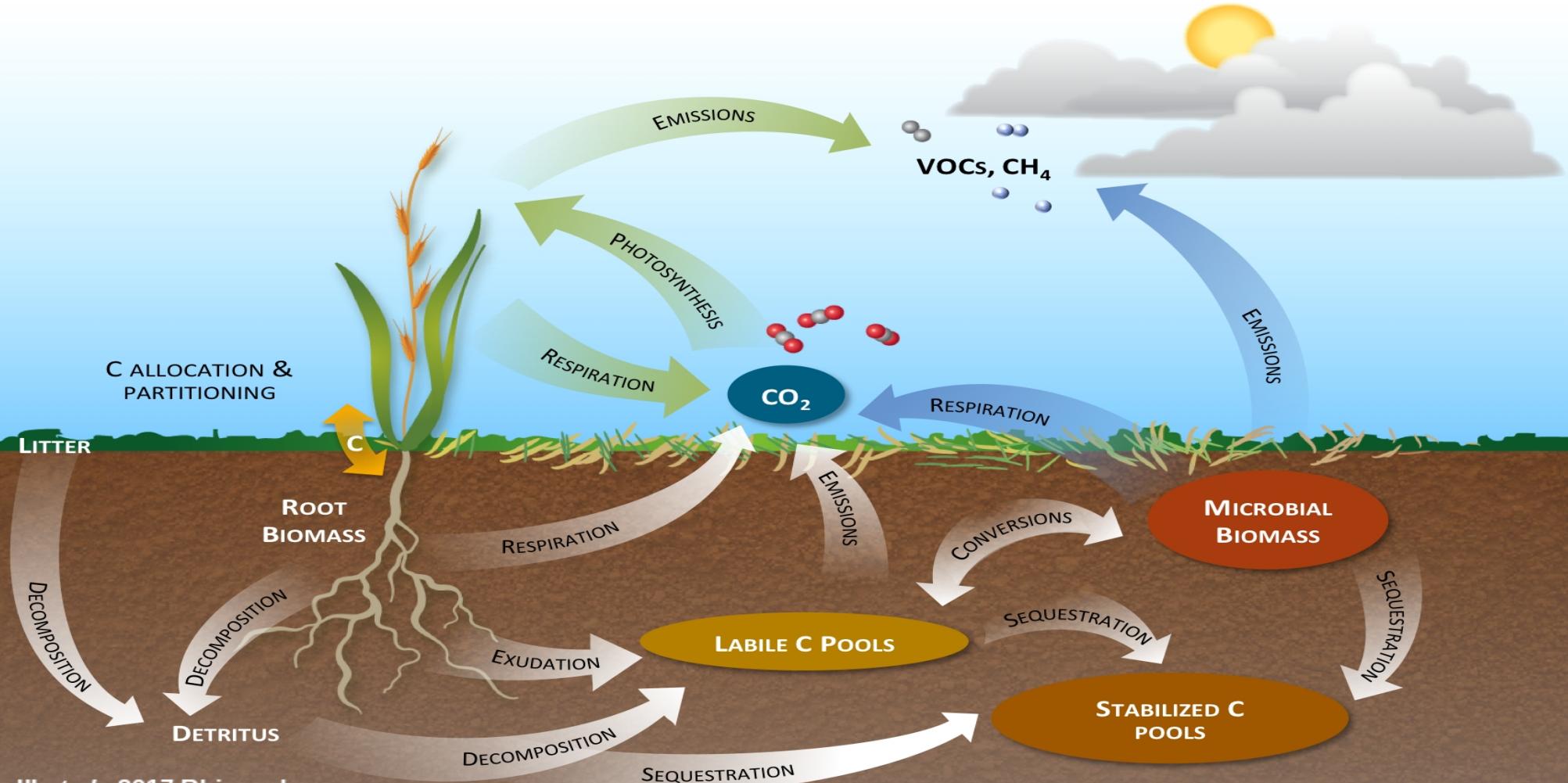
Link to article :

<https://www.nature.com/articles/nprot.2016.148>

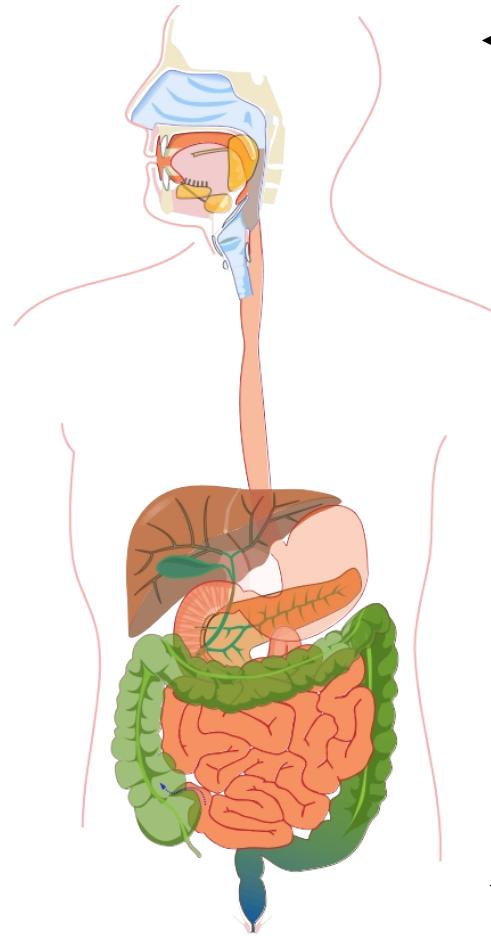
RAW LAB - Rhizosphere impacting carbon cycling



RAW LAB - Rhizosphere impacting carbon cycling



RAW LAB - Human microbiome and virome



100 Trillion

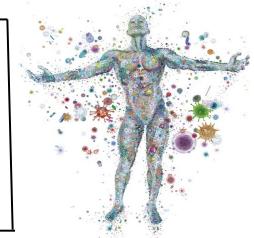
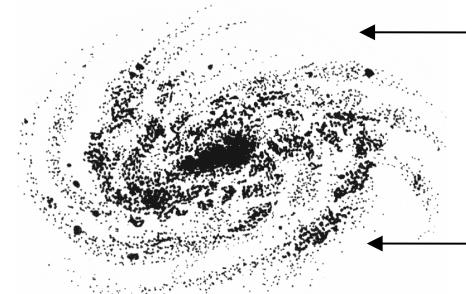
150:1 genes

5:1 viruses

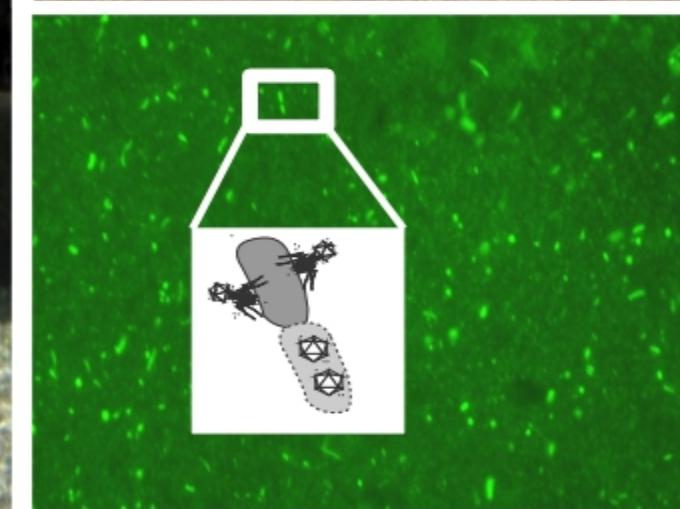
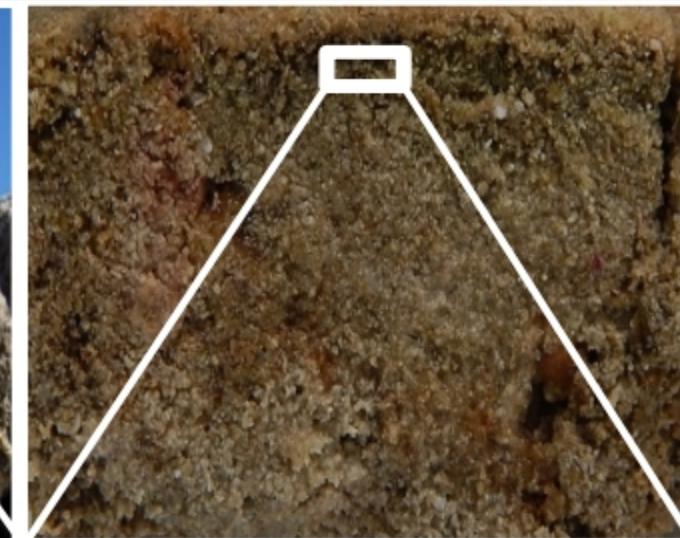
1.3x cells



2.5x
12.5x



RAW LAB - Modern microbialites/stromatolites



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

COURSE CALENDAR (Tentative Plan)

Week 1 (Aug 21rd) Introduction to UNIX and command line

Week 2 (Aug 28th) UNIX commands (cut, grep, etc)

Week 3 (Sep 4th) ~~Sed/grep/bioawk~~ file manipulation

Week 4 (Sep 11th) Regular expressions

Week 5 (Sep 18th) Bash shell scripting basics |

Week 6 (Sep 25th) Bash shell/slurm - SuperCPU operations

Week 7 (Oct 4th) ~~Github~~ introduction and markdown

Week 8 (Oct 9th) **Mid-term Exam**

Week 9 (Oct 16th) Basic Python Commands (Part I)

Week 10 (Oct 23th) **No Classes - Student Recess**

Week 11 (Oct 30th) Basic Python Commands (Part I)

Week 11 (Nov 6th) Python loops, lists, and basic file methods

Week 12 (Nov 13th) Python functions, dictionaries, regular expressions

Week 13 (Nov 20th) **No Classes - Thanksgiving**

Week 14 (Nov 27th) Python - Pandas and ~~Seaborn~~/Review of course

Week 15 (Dec 4th) **Final exam on Thursday Dec 7th**

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