Microbiology at Atomic Resolution Schedule: Final as taught Spring 2023
Welcome to Micro/BMC 668 -- Spring 2023
Check this schedule regularly; it will evolve as peer-reviewed primary literature papers are chosen by class members for their presentations. *(NOTE for distribution student names removed from this version.)*

Our course will be organized via Learn@UW (in particular, Canvas). We'll meet in person Tues/Thurs in the MSB Molecular Modeling Classroom 2530.

Usually I will upload readings, out-of-class exercises, or video content in advance, and I will release an info-announcement in the form of a Canvas "Page" on Thursday evening for the following week's content. This will allow us to spend our in-class time on discussions, problem solving, and Q&A together.

Week 1, 1/24 + 1/26 Protein Structure: History, Building Blocks and Tools

Tues:
Crystallography Concepts: A brief history of protein crystallography.
The peptide bond, protein secondary structure, and protein tertiary structure.

Thurs:
Pre-class: Install Pymol on your own laptop.
In class: Pymol intro and tutorial.
The PDB

Week 2, 1/31 + 2/2 DNA structure and Recognition

Tues: Crystallography Concepts I: crystal growth

Thurs: Structure papers:
IHF; Rice et al 1996
CAP; Sharma et al, 2009

Week 3, 2/7+ 2/9 Structure versatility –4-helix bundle

Tues: Crystallography Concepts II: data collection and resolution, along with intro to Table 1

Thurs: Structure papers:
Redesign of cytochrome; Chu et al 2002

Week 4, 2/14 + 2/16 Two Classic ATPases: F1Fo ATPase and RecA

Crystallography Concepts III: Crystallographic Phases and Electron Density Maps

Structure Concepts: Hexameric ATPase Motors
RecA filament; Chen, Yang, Pavletich Nature 2008

Week 5, 2/21 & 2/23 Membrane Proteins

Crystallography Concepts IV: Map Display and Refinement & Quality Check Parameters
Wlodawer review article, FEBS 2013

Structure Concepts: Outer Membrane Proteins
Outer membrane protein Maltoporin and recognition of sugars:

Schirmer et al, Science 1995 & Wang et al., JMB 1997

Week 6, 2/28 + 3/2 Mind your Ps (and Qs): Phasing, Phenix, Pymol
Crystallography Concepts V: Phasing Revisited – MIR/MAD & DIY in Phenix.
Wlodawer review article, FEBS 2013

Structure Concepts: Inner Membrane Proteins

Tues 2/28: Phenix structure determination and Pymol leveling up -- including MOVIES

Thurs 3/2 First in-class student presentation!
Rhodopsin Luecke et al., PNAS 2008 Xanthorhodopsin structure

Week 7, 3/7 + 3/9 Protein structure prediction
Crystallography Concepts: theory and practical use of structure prediction software
Structural Concepts: validating/recognizing themes of protein folding/structure in the structures

Tues 3/7: Phyre2 & Alpha Fold
Kelley, Mezulis, Yates, Wass & Sternberg, Nature Protocols 2015
Jumper et al., Highly accurate protein structure prediction with Alpha Fold

Thurs 3/9: Antibody Design with AI
Lou et al., NeurIPS 2022

3/14 + 3/16 Spring Break

After spring break, most classes will be student-led.

Week 8, 3/21 + 3/23 Motility

Tues	**Gliding motility**	Hennell et al., Nature Microbiology 2021
OR	**Archael Flagella**	Hu et al. Nature 2011
Thurs	**Bacterial Flagella**	Chang et al, Trends Microbiol 2021

Week 9, 3/28 + 3/30 Through the Membrane

Tues	**BAM & cryoEM**	Doyle et al., Cell 2022
OR	**ATP Synthase**	Davies et al., PNAS 2012
Thurs	**Antimicrobial peptides**	Mian-Chee et al., Sci Reports 2020

Week 10, 4/4 + 4/6 **More DNA Interactions/Transformations**

Tues	**Transposons**	Davies et al., Science 2000
OR	**Replication**	Vaithiyalingam et al., PNAS 2010
Thurs	**Iron Sulfur Cluster Txn Factor**	Rohac & Roman et al., Communications Biology, 2022

Week 11, 4/11 + 4/13
Remote assessment: Structural Microbiology, esp alternative structure determination, seminar options posted.

Week 12, 4/18 + 4/20 DNA Damage & Protection

Tues	**DNA Damage MRe11-Rad50**	Rotheneder et al., Mol Cell 2023
Thurs	**Telomeres**	Jiang et al., Cell 2018

Week 13, 4/25 + 4/27 Fundamental Metabolism

Tues	**Nitrogenase**	Morrison, Spatzal and Rees, JACS 2017
OR	**DNA Binding Small Molecules**	Chenoweth and Dervan, JACS 2010
Thurs	**In-class peer review for final project**	

Week 14, 5/2 + 5/4

Tues	**HIV Reverse Transcriptase**	Su et al., J Virol 2010
Thurs	**TCA Metabolism**	Verschueran et al., Nature 2019

Week 15: Final project due